

APPENDIX H

DEEP WELL BORING LOGS NEAR PROJECT SITE



MICHIGAN DRILLING CO.

Consulting Soils Engineers

14555 WYOMING AVENUE

DETROIT, MICHIGAN 48238

JOB NO. 68-539

LOG OF SOIL BORING NO. 1

PROJECT Soils Exploration

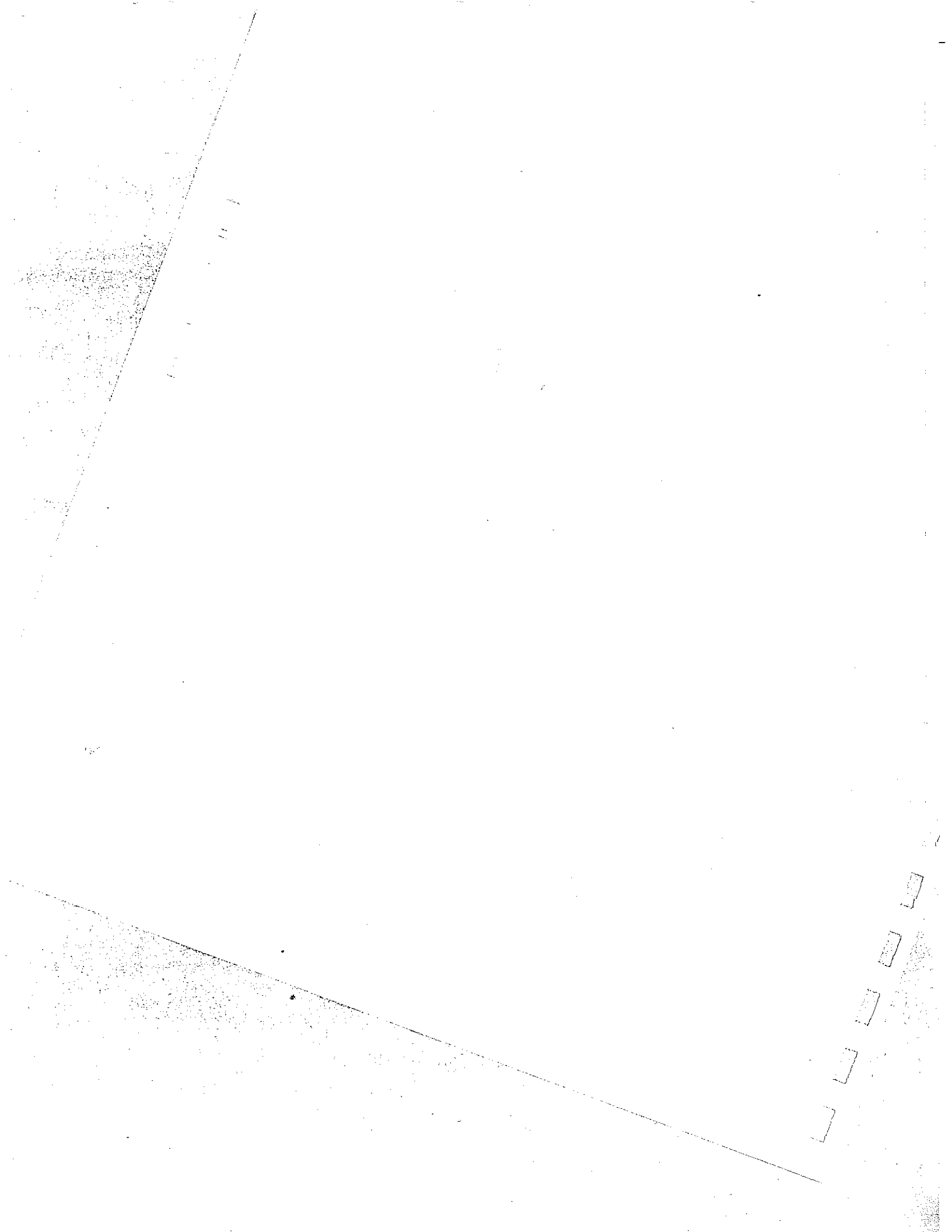
LOCATION Southfield & Outer Drive

Allen Park, Michigan

DATE 5/21/68

SURFACE ELEV. _____

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows Per 6"	Moisture %	Natural Wt. P.C.F.	Und. Comp. Strength PSF	Sw. %
			0'4"					
1A	2	FILL	Firm moist sandy black topsoil					
UL			2'0"					
	4		Firm moist mixed clay fill					
1B	6	FILL	3'0"	2	4	8	25.9	124.3
UL			Compact moist mixed brown sand					
1C	8		6'0"	2	4	6	24.7	121.9
UL			Stiff moist mixed clay fill					3800
	10		Stiff moist silty variegated clay	2	4	7	24.0	121.9
1D								3960
UL								
	12		11'6"	4	6	7	23.5	122.3
								4650
	14							
1E			Firm moist silty blue clay					
UL	16			2	2	3	25.8	123.3
								2450
	18		18'0"					
1F	20							
UL			Stiff moist blue clay, sand and pebbles, rouge markings	2	5	5	13.2	141.3
1G	25							2600
UL								
1H	30		29'0"	2	4	5	15.4	128.0
UL								1060
1I	35			2	2	3	19.7	132.1
UL								1080
1J	40		Firm moist blue clay, sand and pebbles	2	2	3	16.4	130.3
UL								870
1K	45			2	3	3	18.7	132.0
UL								820
1L	50			2	2	3	18.6	128.3
UL								780
1M	55		53'0"	2	3	3	18.8	128.3
UL								870
1N	60			3	4	5	19.5	129.1
UL								1680
1O	65			3	4	5	19.6	130.7
UL			Stiff moist blue clay, sand and pebbles					1060
1P	70			3	5	5	20.8	127.0
UL								870
1Q	75			2	4	5	24.6	126.6
UL								780
1R	80			3	4	5	27.1	123.9
UL								890
1S	85		82'0"	4	5	7	26.0	123.2
UL			86'0"					1580
1T	90			5	23	45	10.9	130.9
UL			91'0"					
	95			100			9.3	144.7
								18960
	100							
TYPE OF SAMPLE D. -DISTURBED U.L. -UNOIST. LINER S.T. -SHELBY TUBE S.S. -SPLIT SPOON R.C. -ROCK CORE OTHER-				REMARKS: Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 36"; Count Made At 6" Intervals				
				GROUND WATER OBSERVATIONS G.W. ENCOUNTERED AT 82 FT. 0 INS. G.W. ENCOUNTERED AT FT. INS. G.W. AFTER COMPLETION 15 FT. 0 INS. G.W. AFTER HRS. FT. INS. G.W. VOLUMES Heavy				



DEEP WELL LOGS

Below is a list of deep wells within the project area obtained from the files of the Department of Natural Resources in Lansing, Michigan. Unfortunately, some of the copies obtained were of poor quality and reproductions included with this report are of very low quality. However, the originals are available for review at the DNR.

From DNR well records, the closest deep well to the project site (water well record for Fairlane East Apts., S.19, T2S, 11E) is approximately one mile to the north and has been plugged and grouted. The other wells listed are approximately one to two miles from the project site.

<u>Number</u>	<u>Well Identification</u>	<u>Well Depth</u>
1	Fairlane East Apts. - SW $\frac{1}{4}$, SW $\frac{1}{4}$ S.19, T.2S, R.11E	125 Feet
2	Panhandle Eastern Pipeline Co. S.19, T.2S, R.11E	3920 Feet
3.	Ford Motor Company Disposal No. 1 SE $\frac{1}{4}$, NW $\frac{1}{4}$, NW $\frac{1}{4}$, S28, T.2S, R.11E	563 Feet
4	Ford Motor Company - Industrial Waste Disposal Well No. 2 - SE $\frac{1}{4}$, NW $\frac{1}{4}$, NW $\frac{1}{4}$, S28, T.2S, R.11E	4308 Feet
5.	Ford Motor Company WSW#4, SW $\frac{1}{4}$, NW $\frac{1}{4}$, S.29, T.2S, R.11E	548 Feet
6.	H.R. Ford Well - NE $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$, S.22, T.2S, R.10E	4050 Feet
7.	Ford Motor Co. (Aurora Gas Co.) LPG- No. 1, SW $\frac{1}{4}$, SE $\frac{1}{4}$, NW $\frac{1}{4}$, S.29, T.2S, R.11E	1033 Feet
8.	Ford Motor Co. (Aurora Gas Co.) LPG- No. 2, NW $\frac{1}{4}$, SE $\frac{1}{4}$, NW $\frac{1}{4}$, S.29, T.2S, R.11E	1250 Feet
9.	Ford Motor Co. (Aurora Gas Co.) LPG- No. 3, NW $\frac{1}{4}$, SE $\frac{1}{4}$, NW $\frac{1}{4}$, S.29, T.2S, R.11E	1256 Feet

MICHIGAN TESTING ENGINEERS, INC.

<u>Number</u>	<u>Well Identification</u>	<u>Well Depth</u>
10	Ford Motor Co. (Aurora Gas Co.) LPG- No. 4, SW $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, S.29, T.2S, R.11E	1256 Feet
11	Ford Motor Co. (Aurora Gas Co.) WSW No. 1, SW $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, S.29, T.2S, R.11E	530 Feet
12	Detroit Salt Mining and Mfg., Co. NE $\frac{1}{4}$, S.33, T.2S, R.11E	1806 Feet

MAY 29 1973

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Wayne	Wayne	1/4 1/4 1/4	19	T 2 N. S.	E/W.

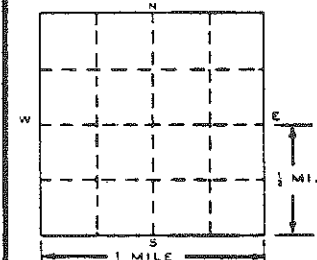
Distance And Direction from Road Intersections

Dr. & 900' west of Greenfield and 1/2 Mile
S. of Rotunda Drive in Melvindale

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL:

Ford Motor Land Development Co.
Address 16099 Rotunda Dr.
Dearborn, Michigan 48120
Att. Mr. William Roycroft

4 WELL DEPTH: (completed) Date of Completion

125 ft. 4-25-73

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Apts.

7 CASING: Threaded ☒ Welded ☐
Diam. _____ Height: Above/Below
Surface _____ ft.
Weight _____ lbs./ft.
Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: _____ Dia.: _____
Slot/Gauze _____ Length _____
Set between _____ ft. and _____ ft.
Fittings: _____

9 STATIC WATER LEVEL
_____ ft. below land surface

10 PUMPING LEVEL below land surface
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) _____ Chlorides (Cl) _____
Hardness _____ Other _____

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐
Depth: From _____ ft. to _____ ft.

14 Nearest Source of possible contamination
_____ feet _____ Direction _____ Type _____
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name _____
Model Number _____ HP _____ Volts _____
Length of Drop Pipe _____ ft. capacity _____ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Fill	12'	12'
Sandy Clay Brown	19'	31'
Clay Soft	24'	55'
Hardpan	2'	57'
Clay Soft. Some Sand	43'	100'
Clay Soft	13'	113'
Hardpan	2'	115'
Sand W/B	1'	116'
Shale	9'	125'
Limestone		125'

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

FAIRLANE EAST APTS.

Hole Plugged and Cemented

DRY HOLE

ADDED INFO. BY DRILLER

CORRECTED BY

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

O. Q. Corsaut, Inc.

0025

REGISTERED BUSINESS NAME

REGISTRATION NO.

Address 15101 W. 11 Mile Road, Oak Park 48237

Signed

AUTHORIZED REPRESENTATIVE

Date

May 22, 1973

Wildcat (00)
TD 3917 in Eau Claire (65)
Dry

Ford Motor Company No. 1

Drilling Contractor: Calvert Eastern Drilling Company (Rotary)

Elevation: 588 feet above sea level (~~194~~ ⁵⁸⁸ bush.)

Record by: William Mantek from samples; sample log; submitted by the company and some formation tops from Schlumberger Gamma Ray-Neutron Laterolog (Schj) and Samples (SA)

	Thickness (feet)	Depth (feet)
PLEISTOCENE:		
Drift:		
"Drift"	113	113
DEVONIAN:		
Dundee:		
Limestone	17	130
Limestone, white to tan, crystalline	10	140
Limestone, white to tan, crystalline; considerable white, rounded-Sand (cavings?)	40	180
Limestone, white to light brown, finely crystalline; Sand as above	10	190
Limestone, tan, finely crystalline; little Sand, as above	5	195 Schj
	(82)	
Detroit River:		
Dolomite, tan to light brown, very finely crystalline to dense, limy, slight dead oil stain	15	210
No Sample	10	220
Dolomite, as above	10	230
Dolomite, tan, very finely crystalline to dense, limy; trace of Anhydrite, white	30	260
Dolomite, tan, dense, slightly limy	10	270
Dolomite, tan to light brown, very finely crystalline to dense; little Anhydrite, white	20	290
Dolomite, tan to buff, dense, anhydritic	20	310
Dolomite, tan to buff, dense, with occasional solution porosity, anhydritic	40	350
Dolomite, tan, very finely crystalline, slightly porous; little Anhydrite, white	20	370
Dolomite, tan, very finely crystalline, slightly porous, with thin black carbonaceous partings	50	420
Dolomite, brown to dark brown, very finely crystalline	20	440
Dolomite, brown, very finely crystalline; Dolomite, tan, dense, to very finely crystalline	40	480 Schj
	(285)	
Sylvania:		
Dolomite, as above; trace Sandstone, white, fine	10	490
Dolomite, tan to brown, very finely crystalline, slightly sandy	30	520
Sandstone, white, fine, subrounded; some Dolomite, brown, very finely crystalline	10	530

This document paid for with State funds

	Thickness (feet)	Depth (feet)
DEVONIAN:		
Sylvania: (Continued)		
Dolomite, tan to brown, dense to very finely crystalline; some		
Sandstone, white, fine	20	550
Sandstone, white, fine, subrounded, dolomitic	10	560
Dolomite, tan to brown, dense to very finely crystalline, slightly		
sandy	40	600 Schj
	(120)	
Bois Blanc:		
Dolomite, tan to brown, very finely crystalline; Chert, buff	20	620
No Sample	8	628 Schj
	(28)	
SILURIAN:		
Bass Island:		
Dolomite, tan	32	660
Dolomite, tan, very finely crystalline to dense	30	690
Dolomite, tan, very finely crystalline; Dolomite, buff, dense,		
slightly anhydritic	10	700
Dolomite, light brown, very finely crystalline; Anhydrite, white	10	710
Dolomite, tan, finely crystalline; trace Anhydrite, white	40	750
Dolomite, tan, finely crystalline; Dolomite, light gray, dense,		
anhydritic	10	760
Dolomite, buff, dense, slightly anhydritic	30	790
Dolomite, buff, dense; some Anhydrite, white	40	830
Dolomite, tan, very finely crystalline; Dolomite, light gray,		
argillaceous and Anhydrite	30	860
Dolomite, tan, very finely crystalline	21	881 Schj
	(253)	
Salina:		
Dolomite, tan to buff, dense; some Shale, gray	29	910
Dolomite, tan, very finely crystalline to dense; some Dolomite,		
gray, argillaceous	40	950
Salt, white to orange; Dolomite, gray, argillaceous ("F" Salt		
@ 946 Schj)	30	980
Dolomite, brown, dense; Salt, white	10	990
Salt, white; Dolomite, gray, dense, argillaceous	30	1020
Shale, gray, dolomitic	10	1030
Shale, gray, dolomitic; Salt, white	10	1040
Salt, white; dolomite, gray, argillaceous	30	1070
Salt, white; some Dolomite, light brown, anhydritic	20	1090
Dolomite, tan, to light brown, anhydritic	20	1110
Dolomite, tan to light brown, anhydritic; Salt, white	10	1120
Salt, white; some Dolomite, buff, anhydritic	20	1140
Dolomite, tan, dense, anhydritic	20	1160
Salt, white; Dolomite, tan to buff, dense	10	1170
Dolomite, tan to buff, argillaceous	30	1200
Dolomite, tan to buff, argillaceous; Salt, white	60	1260
Salt, white	20	1280
Salt, white; Dolomite, buff, argillaceous ("E" Unit @ 1280 Schj)	10	1290
No Sample	10	1300
Shale, gray; Anhydrite, pink	10	1310
Dolomite, tan, very finely crystalline to dense; some Shale,		
gray, anhydritic	30	1340
Dolomite, tan to buff, dense	10	1350

Thickness Depth
(feet) (feet)

SILURIAN:

Salina: (Continued)

Dolomite, tan, very finely crystalline to dense, slightly anhydritic	10	1360
Dolomite, tan to light brown, crystalline to finely crystalline, slight porosity	10	1370
Dolomite, tan, dense, anhydritic; Shale, gray, dolomitic	10	1380
Shale, gray, dolomitic; Dolomite, tan, dense	10	1390
Salt, white ("D" Salt @ 1379 Schj)	20	1410
Dolomite, tan, dense; Shale, gray, salt, white ("C" Zone @ 1412 Schj)	10	1420
Shale, gray, soft	10	1430
Salt, white, as rounded grains; Anhydrite, orange	10	1440
Shale, gray and red, soft; Salt, white	10	1450
Shale, gray-buff, dolomitic	10	1460
Dolomite, tan to buff, dense	10	1470
Dolomite, tan to buff, dense; Anhydrite, white	40	1510
Anhydrite, white to tan; some Dolomite, tan, dense ("B" Unit @ 1508 Schj)	20	1530
Dolomite, tan, dense; some Anhydrite, white	20	1550
Salt, white; (Dolomite, above) ("B" Salt @ 1546 Schj)	20	1570
Dolomite, tan to light brown, very finely crystalline to dense; Salt, white	10	1580
Salt, white (Dolomite cavings?)	60	1640
Salt, white	40	1680
Dolomite, tan to brown, very finely crystalline; Salt, white	10	1690
Salt, white; Trace Anhydrite, tan	100	1790
Dolomite, brown, very finely crystalline to dense, with some dark brown carbonaceous material; some Anhydrite (A-2 Carbonate @ 1780 Schj); Anhydrite, white to tan	10	1800
Dolomite, brown, very finely crystalline to dense, with some dark brown carbonaceous material	10	1810
Dolomite, light brown, dense, anhydritic	10	1820
Dolomite, tan to buff, very finely crystalline to dense, a little dark brown carbonaceous material	10	1830
Dolomite, tan to buff, dense (jet pits)	20	1850
Dolomite, buff to light gray, dense	20	1870
Dolomite, buff, dense; Dolomite, tan, finely crystalline, slightly porous with some dark brown carbonaceous material	10	1880
Dolomite, buff, dense; Dolomite, tan, finely crystalline, slightly porous; little Anhydrite, white to tan	20	1900
Dolomite, buff to gray, dense; little Anhydrite, white	10	1910
Dolomite, buff to gray, dense; some Anhydrite, white to tan (A-2 Anhydrite @ 1926 Schj)	20	1930
Anhydrite, white to tan; some Dolomite, gray, dense (A-1 Carbonate @ 1955 Schj)	30	1960
Dolomite, light brown, finely crystalline, slight fluorescence and porous; some Anhydrite, white	20	1980
Dolomite, tan to light brown, finely crystalline to dense; little Anhydrite, white	10	1990
Dolomite, tan to light brown, dense; trace Anhydrite	10	2000
Dolomite, light brown, dense; Anhydrite, white to tan (A-1 Evaporite @ 2010 Schj)	10	2010
Anhydrite, white to tan	6	2016 Schj

(1135)

	Thickness (feet)	Depth (feet)
SILURIAN: (Continued)		
Niagaran:		
Dolomite, tan to brown, dense, with some black carbonaceous material	4	2020
Dolomite, tan, finely crystalline to dense, some porosity, very slightly fluorescence	10	2030
Dolomite, tan, finely crystalline to sucrose; somewhat porous	10	2040
Dolomite, tan, finely crystalline; some Dolomite, dark brown, very finely crystalline, fair fluorescence	10	2050
Dolomite, tan to buff, very finely crystalline to dense, somewhat cherty	20	2070
Dolomite, tan to buff, very finely crystalline to dense, some black carbonaceous material	20	2090
Dolomite, tan, crystalline with some dark brown included material	10	2100
Dolomite, tan and light gray, finely crystalline	20	2120
Dolomite, tan, sucrose to crystalline; some Dolomite, light gray, very finely crystalline	40	2160
Dolomite, blue-white, sucrose to finely crystalline; little Dolomite, tan, very finely crystalline	30	2190
Dolomite, white, sucrose to crystalline	40	2230
Dolomite, white to blue-white, sucrose to crystalline	31 (245)	2261 Schj
Clinton:		
Dolomite, above; a little Shale, greenish gray, dolomitic	9	2270
Shale, gray to green-gray, dolomitic	10 (19)	2280 Schj
Cataract:		
Cabot Head:		
Shale, as above, Dolomite, tan, crystalline, glauconitic	10	2290
Dolomite, tan to buff, crystalline; Shale, gray	10	2300
Shale, red and green, dolomitic; some Dolomite, white to tan, crystalline	20	2320
Shale, green; some Shale, red; little Dolomite, white to tan	30	2350
Shale, green; dolomite, white to light gray, crystalline	20	2370
Shale, greenish gray, dolomitic; Dolomite, white, light gray, crystalline	13 (103)	2383 Schj
Manitoulin:		
Dolomite, tan to buff, finely crystalline, limy, mottled appearance	30	2413 Schj
ORDOVICIAN:		
Cincinnatian:		
Dolomite, above; Shale, red and green	7	2420
Shale, red and green; Little Dolomite, tan	110	2530
Shale, and some green; Little Dolomite, tan, crystalline	40	2570
Shale, red and green, little Dolomite, tan, crystalline	20	2590
Shale, gray-green; Dolomite, tan to buff, crystalline	30	2620
Shale, green and red; little Dolomite, tan, crystalline	10	2630
Shale, gray green, dolomitic; Dolomite, buff, crystalline to dense	80	2710
Shale, gray-green, somewhat fissile; little Dolomite, tan, crystalline (Utica @ 2695 Schj)	90	2800
Shale, gray; little Dolomite, tan, crystalline	70	2870
Shale, gray; some Shale, dark gray, bituminous	20	2890
Shale, dark gray, bituminous; some Shale, gray green	100 (577)	2990 Schj

Thickness Depth
(feet) (feet)

ORDOVICIAN: (Continued)

Trenton:

Dolomite, tan to light brown, crystalline to finely crystalline, somewhat limy	30	3020
Dolomite, tan to brown, crystalline to finely crystalline, limy; some Calcite crystals and fossil fragments	10	3030
Limestone, white to brown, broken, crystalline, somewhat, fossiliferous	60	3090
Limestone, white to brown, broken, crystalline, somewhat fossiliferous; little Shale, green-gray, glauconitic	40	3130
Limestone, white to brown, crystalline to broken crystalline; somewhat Dolomitic	20	3150
Limestone, white to dark brown, mottled, broken, crystalline	70	3220
Limestone, tan to brown, broken, crystalline, slight fluorescence	30	3250
Limestone, tan to brown, broken crystalline; little Limestone, gray, shaly	10	3260
Limestone, tan to brown, broken, crystalline	30	3290
Limestone, tan to dark brown, broken crystalline	100	3390
Limestone, tan to gray-buff, argillaceous	10	3400 Schj
	(410)	

Black River:

Limestone, tan to brown, broken, crystalline, slightly cherty (Black River Shale @ 3422 Schj)	40	3440
Limestone, tan to brown, dense to broken crystalline, slightly cherty	70	3510
Limestone, tan to gray buff, dense	30	3540
Limestone, tan to light brown, dense, somewhat dolomitic	30	3570
Limestone, tan, dense; little Limestone, light brown, very finely crystalline, dolomitic	10	3580
Limestone, tan to brown, dense; little Shale, gray	20	3600
Limestone, tan to buff, dense to broken crystalline	80	3680
Limestone, tan to light brown, broken, crystalline	20	3700
Limestone, tan to buff, dense	50	3750
Limestone, tan to buff, dense, a little black carbonaceous material	10	3760
Limestone, tan to buff, dense; a little Shale, dark gray, slightly bituminous	30	3790
Limestone, tan to buff, dense	80	3870 Schj
	(470)	

Glenwood:

Shale, greenish gray, micaceous; sandy Dolomitic	4	3874 Schj
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CAMBRIAN:

Trempealeau:

Dolomite, white, very finely crystalline, micaceous, slightly pyritic, slightly glauconitic	14	3888
Dolomite, white to buff white, very fine to finely crystalline, glauconitic, pyritic in part, micaceous in part	10	3898
	(24)	

Eau Claire:

Shale, medium and greenish gray, micaceous, intermixed with some Dolomite, gray, greenish gray, fine grained, micaceous, shaly, glauconitic	(19+)	3917
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Page 6
Panhandle Eastern Pipeline Company
Ford Motor Company

TOTAL DEPTH 3917 Schj
TOTAL DEPTH 3920 Drlr.

Casing Record: *

13 3/8" 122' (120 cement)
8 5/8" 338' (200 cement)

Drilling Commenced: 8-13-64
Drilling Completed: 8-29-64
Initial Production: Dry hole

11-64

28-2S-11E
City of Dearborn (Wayne Co.)

TD 563 in Sylvania
Industrial Waste
Dispc

Ford Motor Company

Ford Motor Co. Disposal No. 1

Permit No. BD 105

Drilling Contractor: Fen-Par Exploration Co. (Rotary)

Location: SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ section 28, T. 2S., R. 11E.
900' from North and 1100' from West line of quarter section

Elevation: Approximately 580 feet above sea level (rig fl)

Record by: B. L. Champion from driller's log

	Thickness (feet)	Depth (feet)
PLEISTOCENE:		
Drift:		
Drift, clay	30	30
Clay and rocks	55 (85)	85
DEVONIAN:		
Dundee-Detroit River:		
Lime	41	126
Lime, dolomite, cherty	28	154
Lime, cherty	42	196
Lime	11	207
Lime, dolomite, hard	18	225
Lime, dolomite, gypsum	10	235
Lime, dolomite, brown	247 (397)	482
Sylvania:		
Sand, white	7	489
Sand, "Sylvania"	69	558
Lime, gray, sandy	2	560
No record	3 (81+)	563
TOTAL DEPTH		563

Casing Record:
7" 483' (95 cement)

Commenced: 2-20-56

Completed: 3-1-56

Initial Production: Industrial Waste Disposal

Ford Motor Company
Mining Properties, Steel Division
3001 Miller Road, Dearborn, Michigan 48121
Industrial Waste Disposal Well #2
SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28, T. 2S., R. 11E
P#184-754-882
Spud Nov. 10, 1975 Complete Drilling Dec. 7, 1975

Elevation:

K. B. 601.64
Ground 587.14

PLEISTOCENE

Drift:

0 - 105 mud, sand, and gravel

DEVONIAN

Dundee:

105 - 149 limestone, white to tan

Detroit River:

149 - 412 dolomite, tan to gray, anhydritic in part

412 - 478 dolomite, tan to dark brown, good porosity

Sylvania:

478 - 500 sand, fine to medium, white, sub rounded,
free, porous, with dolomite and anhydrite
impurity

500 - 530 sand, fine to medium, clear to translucent,
rounded, very porous with traces of dolomite,
brown, finely sucrosic

530 - 550 sand, fine to medium, rounded free, porous

550 - 560 sand, as above, poor cement, porous

560 - 569 sand, medium, rounded, poor cement, porous

569 - 594 sand, tan to light tan, fine, well cemented
with dolomite 90%; chert 10%, light tan with
abundant floating sand grains

Bois Blanc:

594 - 639 dolomite gray, to gray brown, cherty with some
gray chert

SILURIAN

Bass Islands:

639 - 690 dolomite, very finely crystalline, buff to
peach pink

690 - 875 dolomite, tan to gray, anhydritic

Salina:

875 - 948 shale, gray, dolomitic

948 - 1028 salt

1028 - 1061 shale, muddy, anhydritic

1061 - 1126 salt

1126 - 1155 anhydrite

1155 - 1245 salt

Ford Motor Company #2 Industrial Waste Disposal Well
SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28, T. 2S., R. 11E.
P#184-754-882
Elevation: K. B. 601.64; Ground 587.14

Page Two

	Top of "E" Unit
1245 - 1255	shale, gray, muddy
1255 - 1343	dolomite, gray, muddy, anhydritic in part
	Top of "D" Salt
1343 - 1378	salt
	Top of "C" Shale
1378 - 1440	shale, blue gray with few anhydrite streaks
	Top of "B" Unit
1440 - 1450	anhydrite
1450 - 1464	shale, gray, evaporitic
1464 - 1715	salt
1715 - 1740	salt, with light tan to white anhydrite
	Top "A-2" Carbonate
1740 - 1755	dolomite, brown, finely crystalline, carbonaceous
1755 - 1762	dolomite, light brown, finely sub crystalline, anhydritic
1762 - 1800	dolomite, brown, evaporitic
1800 - 1850	dolomite, gray to brown, muddy, evaporitic
1850 - 1866	dolomite, gray, muddy evaporitic
	Top "A-2" Salina Evaporite
1866 - 1901	anhydrite, light tan to white
	Top "A-1" Carbonate
1901 - 1912	dolomite, light tan, finely sucrosic
1912 - 1922	anhydrite, white, with nodules of dolomite, tan
1922 - 1946	dolomite, tan, finely sucrosic
	Top "A-1" Evaporite
1946 - 1952	dolomite, tan, sucrosic, vugular with carbonaceous and anhydritic partings; faint odor gas
	Top of Niagara
1952 - 1994	dolomite, tan to brown, coarsely sucrosic with 10% of this description having thin dark brown to brown partings
1994 - 2100	dolomite, tan, finely crystalline to finely sucrosic with 5% having carbonaceous partings
2100 - 2145	dolomite, tan, crystalline to sucrosic to finely sucrosic, with some scattered porosity
2145 - 2190	dolomite, blue white, finely crystalline
2190 - 2228	dolomite, white to blue white, sucrosic
	Top of Clinton
2228 - 2247	shale, green, dolomitic
	Cabot Head
2247 - 2265	shale, gray and dolomite tan, impure
2265 - 2294	shale, red and green
2294 - 2301	dolomite, tan, crystalline
2301 - 2324	shale, gray to gray-green
	Top of Manitoulin
2324 - 2380	dolomite, tan, and dolomite, gray, argillaceous

Ford Motor Company #2 Industrial Waste Disposal Well
SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28, T. 2S., R. 11E.
P#184-754-882
Elevation: K. B. 601.64; Ground 587.14
Page Three

ORDOVICIAN

Cincinnatian:

- 2380 - 2530 shale, red and green, granular, muddy, little dolomite
2530 - 2610 shale, gray and greenish gray, granular
2610 - 2645 shale, light red brown
2645 - 2795 shale, gray
2795 - 2966 shale, gray to dark gray

Trenton:

- 2966 - 2989 dolomite, tan to light brown, crystalline to finely sucrosic, very slight porosity
2989 - 3045 limestone, light brown, mottled in part, fossil fragments
3045 - 3075 limestone, light tan to brown, fossiliferous, some very thin streaks dark green shale
3075 - 3130 limestone, tan to gray tan, variable crystalline structure
3130 - 3195 limestone, gray brown to brown, with trace of dolomite, tan, sub sucrosic at 3130 - 3140 and trace oolites 3160 - 3170
3195 - 3210 limestone, light tan, poorly crystalline, mottled with limestone, dark gray brown, fragmental, argillaceous
3210 - 3250 limestone, light tan and brown, sub crystalline with increasing amounts of limestone, thin bedded argillaceous, sub sucrosic toward base of description
3250 - 3270 limestone, light tan, sub crystalline to sub sucrosic, slight dolomitic, trace fossil fragments, with thin bedded dark gray brown argillaceous limestone
3270 - 3320 limestone, gray to brown, sub crystalline to sub sucrosic, poor and irregular crystalline structure
3320 - 3330 limestone, very light gray-tan, finely sub sucrosic, trace fossil fragments, with limestone dark gray-brown, argillaceous, thin bedded
3330 - 3340 limestone, gray brown, granular, argillaceous
3340 - 3360 limestone, as above, with limestone, dark gray-brown
3360 - 3370 limestone, very finely sub sucrosic, light gray, tan
3370 - 3510 limestone, light tan, sub crystalline, thin bedded
3510 - 3520 limestone, gray to brown, thin bedded with thin dark brown partings
3520 - 3530 limestone, very light tan, finely sub crystalline
3530 - 3560 limestone, gray, finely sub crystalline, thin bedded, grades darker; dark gray to gray brown partings @ 3550 - 3560

Ford Motor Company #2 Industrial Waste Disposal Well
SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28, T. 2S., R. 11E.
P#184-754-882
Elevation: K. B. 601.64; Ground 587.14
Page Four

Trenton (con't):

- 3560 - 3570 limestone, sub crystalline to sub sucrosic, light drab gray to light gray-tan, thin bedded
3570 - 3580 limestone, tan, finely crystalline to granular
3580 - 3600 limestone, as above, to a drab gray in color with few thin dark partings
3600 - 3640 limestone, finely sub sucrosic to sub crystalline, drab tan
3640 - 3680 limestone, as above, with thin dark brown partings
3680 - 3700 limestone, very finely sub sucrosic with trace fossil fragments
3700 - 3790 limestone, very finely sub sucrosic, drab gray to tan, thin bedded; few dark brown to gray partings and gray mud mottling at 3730 - 3750 and 3770 - 3790
3790 - 3840 limestone, very finely sub sucrosic, gray to light gray brown, with few dark brown partings and increase in gray argillaceous impurity
3840 - 3847 limestone, very very finely crystalline, light brown with limestone, granular, mottled light brown and brown
3847 - 3852 shale, green and gray, micaceous, sandy, dolomitic
3852 - 3868 sand, very fine, well cemented, black pyrite and green glauconite impurity

CAMBRIAN

- 3868 Top of Trempeleau:
3868 - 3887 dolomite, argillaceous, micaceous, gray to blue gray crossbedding showing in thin mud partings, Few mud partings showing abundant floating sand grains; no porosity

Cored 3878 - 3937: full recovery
Cored 3937 - 3997: full recovery
Cored 3997 - 4055: full recovery

- 3887 Top of Eau Claire:
3887 - 3888 sandstone, coarse, sub rounded, hard, quartzitic, slight porosity
3888 - 3898 dolomite, finely crystalline, dense, few large pink crystals
3898 - 3901 dolomite, near white, finely crystalline, partings of dark red mud and few inclusions of pumpkin colored mineral and abundant coarse, rounded, frosted sand grains, slight porosity
3901 - 3902 sand, fine grained, cross bedded with few large pink crystals and partings of dark red mud

Ford Motor Company #2 Industrial Waste Disposal Well
SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28, T. 2S., R. 11E.
P#184-754-882
Elevation: K. B. 601.64; Ground 587.14
Page Five

	Eau Claire (con't):
3902 - 3905.3	sand, very fine grained, light red to light tan porus
3905.3 - 3905.4	mud, hard, gray, impervious
3905.4 - 3911.8	sand, medium size, angular, light red, porus
3911.8 - 3911.9	parting of red mud
3911.9 - 3920	sand, fine to poorly sorted, angular, dark red; some of angularity partially masked by oolitic build up on surface, porus
3920 - 3952	sand, white to very light gray, medium to fine, well rounded, poor cement, porus
3952 - 3956	sand, light gray to tan with mottling of shale, gray, dolomitic cement and finely glauconitic slight porosity
3956 - 3957.5	sand, medium to fine pink, porus
3957.5 - 3959.5	sand, fine, light tan and dark green mottling, cross bedded, muddy, slight permeability
3959.5 - 3960	sand, fine, light tan, sub angular, well cemented, very dolomitic, abundant black specks (marcasite ? poor porosity and permeability
3960 - 3961	dolomite, gray, clear, medium crystalline, varve like bedding, abundant black specks - possible marcasite
3961 - 3969	dolomite, tan to light red, medium to coarsely crystalline, fair permeability
3969 - 3970.5	sand, light red to light tan, fine, angular, dolomitic, fair permeability
3970.5 - 3984	sand, medium fine, sub rounded, light red to light tan, fine to medium, good permeability
3984 - 3986	dolomite, granular, sandy, medium fine, dark red to light gray to light pink, muddy, slight porosity, many green shale partings and few inclusions of brown muddy dolomite
3906 - 3990	dolomite, dark red brown, vertical fractures, horizontal mud partings, only slight porosity
3990 - 3993	sand, fine, angular, pink to green, porus
3993 - 3996	sand, dark red with much cross bedding with depositional mud cracks filled with lithified green mud
3996 - 3998.5	sand, fine, pink to tan with thin cross bedding of well cemented to very well cemented very dark red partings of dolomitic mud, especially at partings at 3998.3 - 3998.5

Ford Motor Company #2 Industrial Waste Disposal Well
SW $\frac{1}{4}$ NW $\frac{1}{4}$ 28 T. 2S., R. 11E.
P#184-754-882
Elevation: K. B. 601.64; Ground 587.14
Page Six

Eau Claire (con't):

3998.5 - 4001.3	sand, very fine, red to light red to light gray-green (possibly glauconitic), with minor cross bedding, hematite cement, occasional inclusion of pumpkin colored mineral.
4001.3 - 4002.4	sand, very dark red-brown, coarse, sub angular to well rounded, well cemented
4002.4 - 4005.4	sand, very fine, light red to light tan, slight permeability, porous zones have dark brown stainings, gray mud partings at 4005.3 - 4005.4
4005.4 - 4006.5	dark red sand, questionable permeability
4006.5 - 4011.8	sand, medium, angular, light red, cross bedded with gray and dark red partings, questionable permeability because of secondary closing of inter granular porosity
4011.8 - 4011.9	sand, gray, mud partings, no permeability
4011.9 - 4014	sand, angular, dark red, poorly sorted, tight many sand fragments are sub oolitic
4014 - 4016.2	sand, light red, angular, poorly sorted, some porosity, possibly local, some thin cross bedding
4016.2 - 4016.8	sand, dark red, fine grained, questionable permeability
4016.8 - 4019.7	sand, very fine, granular, pink, few vugs (possibly due to secondary solution of some mineral pellets), mud partings, thin and gray
4019.7 - 4020	sand, dark red, fine grained to poorly sorted, well cemented
4020 - 4024	sand, medium to coarse, poorly sorted, tan to brown, with nodules of feldspar, porous
4024 - 4032.8	sand, fine to medium, light gray to pink, few partings of good permeability and porosity
4032.8 - 4034.4	sand, medium, sub rounded, light red, cross bedded, slight permeability
4034.4 - 4038.2	sand, red to dark red, fair porosity
4038.2 - 4039.8	sand, light red, coarse to fine, poorly sorted, much cross bedding with green-gray shale, probably low porosity
4039.8 - 4040.5	sand, fine to medium, dark red to red, fair porosity
4040.5 - 4042	sand, fine to medium, angular, gray to pink and mottled with red stain, fair porosity
4042 - 4042.2	sand, fine to medium, as above with \pm .2 foot parting of dark red mud, no effective porosity
4042.2 - 4044	sand, fine to medium, red to dark red, porous
4044 - 4044.3	sand, medium to poorly sorted, dark red, porous
4044.3 - 4044.6	sand, fine, red to light gray, much slumping and cross bedding, low permeability
4044.6 - 4045.5	dolomite, brown, sucrosic, abundant vugs of the size of broomstraw in 4 inch vertical section, insoluble residue showed considerable silt

Ford Motor Company #2 Industrial Waste Disposal Well
SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28 T. 2S., R. 11E.
P#184-754-882
Elevation: K. B. 601.64; Ground 587.14
Page Seven

Eau Claire (con't):

4045.5 - 4046.3

sand, poorly sorted, large grains rounded and frosted, small grains angular, well cemented with dolomite, poor porosity and permeability

4046.3 - 4051

sand, gray, poorly sorted, laminated with gray-green shale and light tan to gray dolomite

4051 - 4055

dolomite, tan to brown, sub sucrosic, vugular with vugules having a coating of secondary dolomite covering the micro crystals within the vugules, low porosity at this time, many inclusions of larger rounded frosted sand grains and other inclusions of pellets or red silt

Drilled 4055 - 4058 after milling up drill stem testing equipment

Cored 4058 - 4117: recovered 59 feet

4058 - 4060

sand, white to pink to red, medium to poorly sorted with thin partings of gray shale

4060 - 4062

sand, gray, medium, poorly sorted, porous

4062 - 4063

sand, red with depositional mud cracks filled with gray mud in 1/4 inch horizontal partings

4063 - 4065

sand, red, poorly sorted to coarse, large sand grains, sub rounded and rounded, frosted

4065 - 4068

sand, white to gray, fine, angular

4068 - 4072

sand, dark red with gray mud partings and mud filled cracks

4072 - 4074

dolomite, sub sucrosic, vugular, muddy with abundant floating sand grains

4074 - 4090

sand, medium to poorly sorted, well cemented with few thin irregular partings of green-gray shale, and inclusions of granular dark red

siltstone; some small peasized inclusions that are red to dark red on outside but are gray-green in center, best porosity 4075.1 - 4075.9;

4079.8 - 4080.1; and 4086 - 4090

4090 - 4109

dolomite, pink, vugular, porous, apparent vugular porosity 4090.8 - 4091.8; 4092.8 - 4094;

4094.9 - 4096; few thin zones of gray-green muddy dolomite and some glauconite, the apparent vugular

4109 - 4117

porosity filled with secondary dolomite dolomite, crystalline to sucrosic, vugular, questionable porosity

Cored 4117 - 4176: full recovery

4117 - 4120

sand, tan to pink, angular, some porosity

Ford Motor Company #2 Industrial Waste Disposal Well
SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28 T. 2S., R. 11E.

P#184-754-882

Elevation: K. B. 601.64; Ground 587.14

Page Eight

Eau Claire (con't):

- 4120 - 4123 sand, gray-green, with some few grains of brilliant red nodules of pink feldspar and glauconite, porus
- 4123 - 4127 sand, fine, well cemented, tight
- 4127 - 4131 sand, fine, dark brown to pink, angular with concentrations of feldspar fragments and also inclusions of nodules of siltstone
- 4131 - 4135.5 sand, pink to red-brown, with abundant pink feldspar and few scattered green partings; some dead oil stain and veins of black carbonaceous material
- 4135.5 - 4141 sand, medium brown to pink, local thin concentrations of feldspar nodules and inclusions of gray siltstone
- 4141 - 4146 sand, fine, gray to pink to dark red, with thin streaks of shale; some fragments of feldspar
- 4146 - 4150 sand, fine, porus, feldspar fragments
- 4150 - 4153 sand, fine, red, few very thin blue-green shale partings; abundant carbonaceous material
- 4153 - 4154 sand, very fine, red, many partings of blue-green shale partings over 70% of core, glauconitic, porus
- 4154 - 4158 sand, red to red-brown, medium tight
- 4158 - 4158.7 sand, very fine with partings of blue-green shale
- 4158.7 - 4160.8 sand, medium fine, dark red-brown; brown feldspar
- 4160.8 - 4161.1 mud, dark green, as above
- 4161.1 - 4163.5 sand, medium fine, dark red-brown; brown feldspar
- 4163.5 - 4163.8 sand, very dark brown to red-brown, interbedded with green shale
- 4163.8 - 4168.7 sand, red-brown, fine to medium, with bands of green shale; porus except at shale interval
- 4168.7 - 4169.7 sand, mottled red to green, with green partings, no porosity
- 4169.7 - 4171.8 sand, red to light red-brown, with bands of green shale
- 4171.8 - 4173.5 sand, fine to very fine to siltstone, pink to light gray-tan, with few floating grains of mud to coarse sand; core tan to red-brown with abundant green partings and green mottled staining near base of description
- 4173.5 - 4176 sand, tan to light brown, very fine grained and hard with few widely scattered and very very thin green partings throughout except very thin and abundant partings at 4175 - 4175.3; abundant flakes of black carbonaceous material; abundant crystalline quartz; some gray feldspar

Ford Motor Company #2 Industrial Waste Disposal Well
SW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 28 T. 2S., R. 11E.
P#184-754-882
Elevation: K. B. 601.64; Ground 587.14
Page Nine

Eau Claire (con't):

Coring program abandoned at depth 4176 feet.
No samples caught at 4176 - 4260 feet.

4176 - 4182

The strata at this depth is believed to be fine grained tan sand with abundant partings of green mud.

4182

4182 - 4258

Top of Mt. Simon:

No samples caught, but the interval drilled from 4182 - 4258 was probably very fine grained angular sandstone having good permeability (from samples and Schlumberger measurement correcting driller's total depth of 4303 to 4308, and the description applied to the corrected depth of 4258) sand, very fine grained, with large grains of sand, white to translucent, rounded to sub rounded, no sand clusters, but some sand grains included in light pink to dark pumpkin colored siltstone

4268 - 4274

granite wash with fragments of red and green granite in finely textured red siltstone

4274 - 4288

granite wash of fine fragments of dark green to very dark green granite with minor quantities of dark red to brilliant (almost fluorescent) red colored siltstone, feldspar and mica abundant granite wash, as above, with a greater amount of pale green to dark green and nearly transparent cementing material

4288 - 4308

4308

TOTAL DEPTH

Industrial (45)
TD 548 in Sylvania (38)
Brine Disposal

29-2S-11E
Dearborn Twp. (Wayne Co.)

Marathon Oil Company

Ford Motor Co. WSW #4

Permit No. B D - 143

Drilling Contractor: North American Drilling Co. (Rotary 0-548)

Location: P.C. 33 SW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 29, T. 2S, R. 11E
880' + southeasterly on Schaefer Rd. from center of intersection of
road 11 thence - 156' + southwesterly from center of Schaefer Rd.

Elevation: 594.5 feet above sea level (rot. bush.)

Record by: H. Laaksonen from driller's log & core description submitted by
the company

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Clay & silt	92	92
"Drift"	20	112
	(112)	
DEVONIAN:		
Dundee-Detroit River: (Pre Report Dundee @ 112 Sj)		
Lime	22	134
Lime & dolomite (Pre Report Detroit @ 168 Sj (?))(Water @ 198)	94	228
Lime (Pre Report Crevice 198-199, water flow at depth of 230 believed to be from crevice. Specific gravity similar to fresh water; but contains lots of H ₂ S)	108	336
Lime, anhydrite, dolomitic	66	402
Lime, sandy	46	448
Core #1 448.0-548.0 (Recovered 100')		
Dolomite, gray, fossiliferous, lower contact not present	6.4'	454.
Sylvania: (Core #1 Continued)	(342.4')	
Sandstone, white, medium-fine grained, friable, moderate-high angle cross-stratification, filled vertical fractures (Pre Report Sylvania @ 456 Sj)	2.6'	457.0
Lost core	10.0'	467.0
Sandstone, white, medium-finely grained, massive-high angle cross-stratification, fractured, minor shale pebbles, burrowed	17.0'	484.0
Lost core	8.0'	492.0
Sandstone, white, medium-fine grained, massive-high angle cross-stratification, fractured, lower contact sharp	29.0'	521.0
Dolomite, gray, minor vertical fractures, numerous irregular nodules of chert	27.0'	548.0
	(93.6+)	
TOTAL DEPTH		548

Casing record:

24" 5 (10 cem.)
13-3/8" 71.5 (140 cem.)
9-5/8" 460 (300 cem.)

Commenced: 3-7-67

Completed: 3-16-67

Well Completed: 4-26-67

Initial Production: Brine Disposal

3-20-69

kcb

22-2S-10E
Dearborn Twp. (Wayne Co)

(R) Exploratory (CO)
TD 4050 in Trempealeau (61)
Dry

H. R. Ford Well

Location: NE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 22, T 2S, R 10E, Dearborn Twp.
In village of Dearborn, on south side of Michigan Central Railroad,
and about 100' south of H. R. Ford Machine shops

Elevation: 612 feet above sea level

Record by: R. A. Smith from samples taken by Geo. T. Bench, Fostoria, Mich. &
from driller's log. Drilled in 1915 by Schrier & Kerr, Newark &
Lancaster, Ohio. Well begun June 14, 1915

	Thickness (feet)	Depth (feet)
PLEISTOCENE:		
Drift:		
Clay & gravel	123	123
Gravel with fresh water	2	125
DEVONIAN:		
Dundee:		
Limestone, light to dark gray & buff, with cherty fossiliferous & bituminous horizons (135-140' a flow of sulphate water)	75	200
Limestone, light gray to dark buff, bituminous, crystalline, with sandy bituminous streaks	15 (90)	215
Detroit River: (Lucas dolomite member)		
Dolomite, gray, argillaceous & bituminous; strong odor petroleum	10	225
Dolomite, dark brown & light gray to buff, fine grained, argillaceous, with black bituminous shaly partings & some fine white anhydrite & selenite	35	260
Dolomite, light to dark bluish-gray & buff, argillaceous, with mottlings & streaks of distinct grayish-blue; pure white anhydrite 270-75')	20	280
Dolomite, dark brown, granular; dolomite, dark gray, fine grained, filled with specks, masses and streaks of carbonaceous material, and also some streaks of anhydrite, white	30	310
Dolomite, light to dark buff, bituminous, locally argillaceous with seams & thin beds of pure white anhydrite	25	335
Dolomite, light grayish-buff, argillaceous & brown, bituminous & fine grained to sugary with considerable anhydrite & selenite, especially from 345-350' & 355-60'	80	415
Flat Rock Dolomite Member:		
Dolomite, gray to dark grayish-buff, dark brown & black bituminous, locally argillaceous & cherty; considerable anhydrite, especially 490-95'	80 (280)	495
Sylvania:		
Dolomite, dark buff-gray, very porous and sandy, bituminous & granular; pure white quartz grains embedded in a matrix of dolomite	10	505

	Thickness (Feet)	Depth (Feet)
Salina (Contd)		
Dolomite, dark buff, gray, shaly in places & with dark gray & brownish-black shale	40	2000
Anhydrite, white with some dark shale & shaly dolomite	5	2005
Dolomite, white to light gray & dark gray, shaly, with much celestite & anhydrite, shale in places	25	2030
Dolomite breccia composed of fragments of dolomite, light to dark gray & brown and cemented together with celestite & calcite; some anhydrite	10	2040
Dolomite, light buff to gray	45	2085
Dolomite, light to very dark gray & buff & brown, bituminous & shaly; some anhydrite; brine 2100'	150	2235
Dolomite, light to buff, with some dolomite, light to dark bluish-gray & some white & light bluish-white, crystalline; screw apparently just penetrated the top of the Guelph dolomite	5	2240
	(1285)	
Niagaran-Clinton:		
Dolomite, pure white to bluish-white & light bluish-gray, crystalline; a little brine (7 bailers in 3 hours but brine at 2100' not cased off)	95	2335
Dolomite, light to dark bluish-gray, argillaceous, crystalline	5	2340
Shale, gray, dolomitic; some pyrite	5	2345
Shale, gray, dolomitic; dolomite, gray, shaly, crystalline; dolomite, white, crystalline	10	2355
	(115)	
Cataract: (Cabot Head Member)		
Shale, dark purplish-red & green to gray; dolomite, gray; red shalesplotched with green & dolomite with green & gray shale	10	2365
Chiefly purplish-red shale with gray & greenish-gray splotches	25	2390
Shale, gray to green, very fissile and in places non-calcareous; dolomite, gray to white; fossils & a little red shale	50	2440
	(85)	
Manitoulin Member:		
Dolomite, gray to buff-gray, crystalline; dolomite, gray, shaly; shale, red & blue with brachiopods	25	2465
Dolomite, light grayish-buff to buff, crystalline; some chert & fossils	25	2490
	(50)	
ORDOVICIAN:		
Cincinnati:		
Shale, dark brownish-red with fissile streaks; blue, gray & red shale; dolomite, light buff to grayish-black, bituminous & shaly	30	2520
Shale, greenish-gray; shale, dark purplish-red with greenish-gray splotches; some dolomite, gray, in places argillaceous	95	2615
Shale, gray to greenish-gray with some shale, dark purplish-red a considerable amount of argillaceous limestone from fossils, brachiopods, bryozoa	30	2645
Dolomite, dark gray & buff, in part argillaceous; shale, red & greenish-gray to gray	5	2650

	Thickness (Feet)	Depth (Feet)
Salina: (Contd)		
Streaks of shale, gray & buff dolomite, with a little anhydrite	5	1045
Chiefly white salt with streaks of gray shale & dolomite	25	1070
Shale, gray with some salt	5	1075
Chiefly white salt; some shaly matter	65	1140
Shale, gray with white & red salt	10	1150
Salt, white with some rusty brown salt	10	1160
Dolomite, buff & anhydrite; shale, gray & shaly dolomite, with some salt	15	1175
Salt, white, with some gray shale & dolomite, apparently from above	25	1200
Dolomite, light buff	5	1205
Salt, white, with a thin streak of light buff dolomite & white anhydrite 1210-15	35	1240
Dolomite, light buff, anhydrite, salt & shale	5	1245
Anhydrite & dolomite, light to dark buff	20	1266
Shale, gray; dolomite, gray to buff; some anhydrite	5	1270
Salt, white, with some gray shale at top	25	1295
Shale, gray to dark gray; argillaceous dolomite; some white salt	5	1300
Salt, white with gray shale & dolomite at the top & bottom	55	1355
Shale, gray to dark gray, with some reddish anhydrite	25	1380
Shale, light to dark gray & dolomite; some anhydrite	50	1430
Dolomite, buff	10	1440
Dolomite, dark grayish-buff, argillaceous; shale, dark gray; some dolomite, buff; anhydrite	25	1465
Salt, white	20	1485
Shale, gray; dolomite, buff; anhydrite, brown with some salt	5	1490
Salt, white	25	1515
Shale, gray & rusty red salt grading downward into soft gray shale with a little anhydrite	50	1565
Dolomite, gray & buff, in places very shaly; some anhydrite	20	1585
Shale, gray, dolomitic; shale, gray; white salt at bottom	15	1600
Salt, white with buff dolomite at bottom	35	1635
Dolomite, buff to gray	5	1640
Salt, white with buff dolomite at top	25	1665
Chiefly dolomite with white salt & dark buff anhydrite	15	1680
Salt, white, alternate layers of buff dolomite & gray argillaceous dolomite	15	1695
Salt, white with streaks of dolomite, buff to gray & dark dolomitic shale 1715-20	65	1760
Dolomite, buff to brown, argillaceous & white salt	10	1770
Salt, white with dolomite, buff to dark brown, bituminous, at the top	10	1780
Dolomite, buff to brown & anhydrite	5	1785
Salt, white with streaks of salt at the top & reddish salt & buff anhydrite near the bottom; bottom of salt beds; aggregate thickness of salt beds 550'; clear white salt about 520'	90	1875
Dolomite, light to dark buff, very bituminous; anhydrite, buff; dark shale at the bottom	20	1895
Dolomite, dark buff, bituminous to light buff & gray dolomite with black bituminous laminae	25	1920
Dolomite, dark gray, shaly & shale, dark gray with some white dolomitic streaks near the bottom	40	1960

	Thickness (Feet)	Depth (Feet)
Cincinnatian: (Contd)		
Shale, dark gray & greenish-gray with a little red shale & some dark crystalline dolomite, largely fossils-brachiopods, bryozoa, etc.	30	2680
Limestone, gray, crystalline; dolomite, gray, argillaceous; shale, gray, pyritic	15	2695
Shale, dark gray & greenish-gray, pyritic; white to dark gray, argillaceous limestone; limestone, gray, shaly	40	2735
Shale, gray to greenish-gray & blue; limestone, grayish-buff, dolomitic, very fossiliferous - brachiopods, bryozoa, etc.	25	2760
Shale, grayish-blue, fossiliferous in places	180	2940
Shale, dark brownish-gray & dark brown, bituminous; shale, blue & gray	125 (575)	3065

Trenton-Black River:

Dolomite, buff to dark grayish-buff, bituminous, granular with some calcite & dolomite spar; some shale, dark brown at top much dark gray & brown, apparently from above	30	3095
Limestone, white & light to dark grayish-buff, with dark buff bituminous layers 3205-15 & 3230-35; much white calcite from fossils	185	3280
Limestone, very dark buff & brown, bituminous with some white & light buff; locally some shale, gray, argillaceous	155	3435
Limestone, brownish-black, bituminous; limestone, fossiliferous; some limestone, white to dark buff	5	3440
Limestone, light to dark buff & brown, bituminous; some calcite, white	15	3455
Limestone, brownish-black, very bituminous	15	3470
Limestone, gray to grayish-black, bituminous & fossiliferous	25	3495
Limestone, light to dark buff; darker toward bottom	110	3605
Limestone, buff-gray to dark grayish-buff; some limestone, light gray	80	3685
Limestone, light to dark buff, bituminous, with some white limestone & calcite	60	3745
Limestone, grayish-buff & dark grayish-buff; some limestone, white & light buff	70	3815
Limestone, dark grayish-buff & light buff; some white	80	3895
Limestone, dark grayish-brown, bituminous, thin-bedded, fine grained	45 (875)	3940

OZARKIAN:

Trempealeau:

Sandstone, white, pyritic & very fine grained, dolomitic with pea green streaks	5	3945
Sandstone, gray to very dark & white, pyritic, fine grained, dolomitic	40	3985
Sandstone, white to light gray & buff, dolomitic	50	4035
Sandstone, white, very fine grained dolomitic with bright green streaks; strong brine filled to within 200' of top	15 (110+)	4050

TOTAL DEPTH

4050

(Tools lost & well abandoned after about three months of unsuccessful fishing.) Commenced: June 14, 1915

2022S-113
City of Detroit (Wayne Co.)

LPG Storage
TD 1250 in Salina

Aurora Gasoline Company

Ford Motor Co. (Aurora Gasoline Co.) 192 No. 1

Permit No. 20690

Drilling Contractor: Union Rotary Corporation (Rotary)

Location: S $\frac{1}{2}$ S $\frac{1}{2}$ NE $\frac{1}{4}$ section 10, T. 28., R. 11E.
550' from South and 400' from East line of quarter section

Elevation: 536 feet above sea level (ord. elev.)

Records: R. L. Champion from sample log and core descriptions
submitted by the company

DEPTH (feet):	Thickness (feet)	Depth (feet)
Drill:		
25' GRAY	25	25
25' GRAY with pink cast	20	45
55' GRAY, sandy and pebbles	55	100
	(100)	

DEPTH (ft):

Detroit River:

slonite, buff to gray, fine to medium crystalline, slightly fossiliferous (Pre. Raposa-shale of dead oil)	30	130
slonite, white to buff, finely crystalline, fossiliferous	20	150
slonite, buff to light gray, finely crystalline with some anhydrite	60	210
slonite, buff, oolitic, medium crystalline	10	220
slonite, buff to gray, finely crystalline, abundant anhydrite (flow of black sulfur water 247-250)	40	260
slonite, gray, finely crystalline, some anhydrite	10	270
slonite, gray and brown with some dolomite	10	280
slonite, gray and buff, finely crystalline anhydritic	40	320
slonite, light gray to buff, very finely crystalline, dense	20	340
slonite, gray to dark gray mottled	20	360
slonite, buff to brown, finely crystalline, anhydritic	40	400
slonite, brown, medium to coarsely crystalline	10	410
slonite, brown to buff, finely crystalline to granular	49	459
	(359)	

Sylvania:

slonite, sandstone, white, medium to coarse, dolomitic	11	470
slonite, gray-brown, sandy, finely to medium grained	10	480
slonite, brown and gray; sandstone, gray to white, fine to coarse	31	511
sandstone, clear, medium to coarse grained	9	520
slonite, gray, fine grain d, slightly sandy	10	530
slonite, gray, very sandy, medium grained	48	578
	(119)	

DEVONIAN-SILURIAN:

Boys Island-Bass Island:

slonite, gray, finely crystalline, sandy, very cherty	22	600
slonite, gray, very finely crystalline, dense	10	610
slonite, gray and brown, finely crystalline	16	626
slonite, brown to buff, finely crystalline to granular, slightly anhydritic	74	700
slonite, brown and gray, finely crystalline, abundant gray anhydrite	27	727

	Thickness (feet)	Depth (feet)
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DEVONIAN-SILURIAN:

Bed: Blaine-Iss Island: (Continued)

Dolomite, buff-gray, very finely crystalline	64	791
Dolomite, buff, very finely crystalline	9	800
Dolomite, gray to dark gray, very finely crystalline	20	820
Dolomite, brown and gray; some anhydrite	5	825
Dolomite, buff, very finely crystalline, dense	15	840 Schj.
	(262)	

SILURIAN:

Salina:

Dolomite, dark gray, mottled, finely crystalline anhydritic	35	875
---	----	-----

(Contd)

Dolomite, dark greenish gray to gray, fine grained, with interbedded irregular masses of gray anhydrite; numerous shaly laminae; few vertical fractures cemented with orange salt	14'6"	889.5
Dolomite, dark gray and brown, fine grained, anhydritic, many shaly laminae	4'	893.5
Dolomite, dark greenish gray, fine grained; some buff dolomite; scattered gray and blue-gray anhydrite, becoming more abundant in lower half of bed	11'6"	905
Dolomite, gray and brown, fine grained, anhydritic, many shaly laminae	3'	908
Dolomite, gray, very fine grained, anhydrite inclusions; several salt-scale, vertical fractures	6'	914
Dolomite, greenish gray, fine grained, with irregular lenses of gray anhydrite; interbedded with buff dolomite containing many shaly laminae and shale and anhydrite pebbles; lower half contains included masses of orange salt	17'6"	931.5
Dolomite, white to dark gray, coarsely crystalline with irregular masses of dolomite and anhydrite	4'6"	936
Anhydrite, brown to blue-gray, halitic, dense	4'	940
Dolomite, gray, fine grained, anhydritic, anhydrite inclusions numerous	3'	943
Dolomite, dark brown, very coarsely crystalline; lenticular anhydrite becoming more abundant in basal 2 feet	11'6"	954.5
Dolomite, brown to buff, coarsely crystalline, few lenses anhydrite; one loc dolomite at top	4'6"	959
Anhydrite, brown to gray, dense; 5" white salt in middle	4'6"	963.5
Dolomite, brown to gray, fine grained, shaly laminae	2'6"	966
Dolomite, brown, coarsely crystalline; small masses included anhydrite throughout	3'	969
Dolomite, gray, fine grained, thin bedded with blue-gray anhydrite; orange salt inclusions	3'6"	972.5
Dolomite, brown to gray, with scattered small masses anhydrite; the few dolomite masses, gray, fine grained, halitic, very shaly partings	18"	990.5
Dolomite, brown to buff, coarsely crystalline, with scattered anhydrite and some dolomite	15'6"	1006
Dolomite, brown to buff, becoming more clear and higher purity toward top, coarsely crystalline 6" dolomite at base	14'	1020
Dolomite, gray to brown, clear, coarsely crystalline; some anhydrite and dolomite in upper half	3'	1023
Dolomite, micaceous, dark gray and buff, fine grained; anhydrite abundant in top 2 feet; coarse salt throughout	10'	1033

0 99

29-2S-11E
City of Detroit (Wayne Co.)

Liquid Petroleum Gas Storage
TD 1250 in Salina

Aurora Gasoline Co.

Ford Motor Co. (Aurora Gasoline Co) No. LPG 2

Permit No. 20697

Drilling Contractor: Union Rotary Corp. (Rotary)

Location: NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ section 29, T. 2S., R. 11E,
850' from South and 950' from East line of quarter section

Elevation: 536.2 feet above sea level (gr. elev.)

Record by: P. L. Champion from sample log submitted by the company
and Schlumberger logs (Schj.)

DEPTH (feet)	THICKNESS (feet)	DEPTH (feet)
Drill:		
gray, gray and yellow, slightly sandy	20	20
gray, gray, sandy with traces of gravel	73	93
	(93)	
DEVONIAN:		
Durham:		
Dolomite, buff, fine to coarsely crystalline, fossiliferous	16	109
Limestone, white to buff, finely crystalline, slightly argillaceous	16	125
Dolomite, buff, finely to very coarsely crystalline, fossiliferous	25	150
Dolomite, buff to white, medium crystalline, slightly porous	20	170
Dolomite, white, medium to granular	10	180
Dolomite, buff to white, finely to coarsely crystalline, fossiliferous	10	190
Limestone, white, fine grained, friable to cemented	20	210
	(117)	
Detroit River:		
Dolomite, white, finely crystalline to granular	10	220
Dolomite, buff, coarsely crystalline and fossiliferous	4	224
Dolomite, white to buff, finely crystalline, dense	56	280
Dolomite, buff, finely crystalline and granular; some anhydrite	20	300
Dolomite, white to buff, finely crystalline, scattered coarse sand grains	24	324
Dolomite, buff, finely crystalline to granular, trace anhydrite	21	345
Dolomite, buff, green and pink cast, finely crystalline to granular	35	380
Dolomite, buff, finely crystalline, abundant brown anhydrite	20	400
Dolomite, brown and buff mottled, finely crystalline to granular, slightly anhydritic	24	424
Dolomite, buff, pink cast, fine to granular, slightly anhydritic	41	465
	(255)	
Sylvania:		
Sandstone, clear, fine to medium grained, loose	40	505
As above, to coarse, slightly argillaceous	20	525
Sandstone, dolomitic, gray to pink cast, fine to medium grained	10	535
Dolomite, gray and pink, finely crystalline, slightly sandy abundant chert	26	561

Parora Gasoline Co.
Ford Motor Co. No. LPM 2

	Thickness (feet)	Depth (feet)
DEVONIAN:		
Sylvania: (Continued)		
Sandstone, clear, medium grained, loose	15 (111)	576
Bele Blane:		
Dolomite, sandy, gray to green, fine to coarsely crystalline, very cherty	24	600
Dolomite, gray and buff, finely crystalline, cherty	15 (39)	615
SILURIAN:		
Mass Island-Salina: (top Salina 840 Schj.)		
Dolomite, buff and light gray with green cast, finely crystalline	10	625
Dolomite, buff, pale green and pink mottled, very finely crystalline to sucrosic; scattered anhydrite	104	729
Dolomite, gray, green and pink cast, very finely crystalline, loose	3	735
As above, to sucrosic	30	765
Anhydrite, white	5	770
Dolomite, buff, green, finely crystalline, anhydritic	35	805
Anhydrite, white and brown mottled, granular to massive, as dolomite	15	820
Dolomite, buff, green and pink mottled, very finely crystalline, anhydritic	30	850
Anhydrite, white and brown mottled	5	855
Dolomite, gray and buff, finely crystalline, anhydritic	20	875 Schj.
Shale, gray, soft; dolomitic streaks	15	890
Dolomite, gray, green mottled, finely crystalline, anhydritic; faily partings	39	929
Shale, clear to buff, some anhydrite	14	943
Anhydrite, brown, fine crystalline	12	955
Shale, clear to buff, gray, some anhydrite	8	963
Shale, as above, with interbedded brown anhydrite	13	976
Anhydrite, gray, green and violet cast, fine grained	4	980
Shale, clear to buff, both disseminated and anhydrite	15	995
Anhydrite, gray, green and violet cast, fine grained	10	1005
Shale, clear to light gray, scattered anhydrite	25	1030
Shale, gray violet, brown, soft, dolomitic	10	1040
Interbedded salt, anhydrite and shale	10	1050
Anhydrite, brown to buff, finely crystalline	10	1060
Shale, gray, soft; with anhydrite, gray to brown	10	1070
Shale, gray to brown, some clear; some anhydrite	25	1095
Anhydrite, brown and buff mottled, finely crystalline	18	1105
Shale, clear to buff, some anhydrite	21	1126
Shale, buff, pink and green mottled, fine grained, anhydritic	19	1145
Shale, brown and buff; with dolomite; soft shale at base	12	1157
Shale, clear to gray; anhydrite and shale at top (1150 BPM = top Silurian)	26	1183
Anhydrite, gray and brown mottled, fine grained, halitic	6	1189
Shale, clear, some gray and buff; scattered anhydrite, becoming abundant in lower 10 feet	54	1243 0 99
Anhydrite, gray and brown mottled, fine grained, slightly chromitic	7 (635+)	1250

TOTAL DEPTH 1250

Page 2

Aurora Gas Co.

Perforator Co. (Aurora Gas Co.) L.P.G. No. 4

Thickness (feet)	Depth (feet)
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WILKINSON-SUMMIT:

Wilkinson-Summit Island-Salina: (Continued)

Silt, sand

71	1240
----	------

Silt

15	1255
----	------

Hydrite

1	1256
---	------

(922*)

TOTAL DEPTH

1256

Gravel, Bas. sh:

1" (275 cement)

1" (520 cement)

1"

Completed: 12-3-59

Completed: 12-13-59

Initial Production: L. P. G. Storage

11-23-61

0 99

Amor Diesel Co Company

Permit No. BD-126

Record by: B. L. Champion from Miller's log

PLEISTOCENE:

Drill:

11. 11.

Thickness
(feet)

Depth
(feet)

115

775

DEVONE 12

Dunc 34

I ... 'Dunde'

75

230

Det. M. J. Over

1. NO₂ brown

anhydride

is broken

J. Mac. Brown

110

700

110

410

32

442

28

470

(280)

Syl: 1000 (Pre Report-top Sy 1000 t 500)

6-24, pray

60

530

(604)

TOTAL DEPTH

530

Casino Record:

5/8" 67° (3.0 percent)

Completed: 12-20-59

Completed: 12-23-59

Initial Production: Dry Hole-Brine Disposal Well

Allen Park Clay Mine

Ground Water Monitoring Data

Drinking Water and Water Quality Parameters

Well: 2-D Down Gradient

Date Sampled: 08-18-01

<u>Parameter</u>	<u>Units</u>	
Static	Feet	600.67
Arsenic	mg/l	<0.0003
Barium	mg/l	<0.100
Cadmium	mg/l	0.240
Chromium	mg/l	<0.010
Fluoride	mg/l	0.940
Lead	mg/l	<0.050
Mercury	mg/l	<0.0002
Nitrate	mg/l	<0.100
Selenium	mg/l	<0.0003
Silver	mg/l	<0.010
Endrin	ug/l	<0.0002
Lindane	ug/l	<0.004
Methoxychlor	ug/l	<0.010
Toxaphene	ug/l	<0.005
2,4-D	ug/l	<0.100
2,4,5-TP/Silvex	ug/l	<0.001
Radium	pCi/l	<5.00
Gross Alpha	pCi/l	<5.00
Gross Beta	pCi/l	<5.00
Coliform Bact.	co/100ml	2.00
Chloride	mg/l	150.
Iron	mg/l	<0.030
Manganese	mg/l	<0.010
Phenols	mg/l	0.008
Sodium	mg/l	110.
Sulfate	mg/l	1050.

Time of Execution: 06/18/84 1510.0 edit Men

Allen Park Clay Mine
Ground Water Monitoring Data
Drinking Water and Water Quality Parameters
Well: 2-D Down Gradient

Date Sampled: 05-06-82 07-14-82 11-26-82

Parameter	Units			
Static	Feet	599.01	600.68	600.68
Arsenic	mg/l	<0.010	<0.001	<0.001
Barium	mg/l	<0.040	<0.020	<0.100
Cadmium	mg/l	0.023	0.006	<0.003
Chromium	mg/l	0.050	0.011	0.016
Fluoride	mg/l	0.900	0.800	0.900
Lead	mg/l	0.093	0.030	<0.010
Mercury	mg/l	<0.0002	<0.0002	<0.0002
Nitrate	mg/l	<0.010	0.010	<0.010
Selenium	mg/l	<0.010	<0.010	<0.010
Silver	mg/l	0.018	0.004	0.008
Endrin	ug/l	<0.100	<0.100	<0.100
Lindane	ug/l	<0.100	<0.100	<0.100
Methoxychlor	ug/l	<0.500	<0.500	<0.500
Toxaphene	ug/l	<1.00	<1.00	<1.00
2,4-D	ug/l	<0.100	<0.100	<0.100
2,4,5-TP/Silver	ug/l	<0.050	<0.050	<0.050
Radium	pCi/l	<5.00	<5.00	<5.00
Gross Alpha	pCi/l	<5.00	<5.00	<5.00
Gross Beta	pCi/l	<4.00	<8.00	<8.00
Coliform Bact.	co/100ml	<2.00	<4.00	<2.20
Chloride	mg/l	170.	170.	170.
Iron	mg/l	5.10	0.840	0.450
Manganese	mg/l	0.130	0.023	0.024
Phenols	mg/l	0.004	<0.004	<0.004
Sodium	mg/l	120.	110.	240.
Sulfate	mg/l	870.	1000.	880.

Time of Execution: 06/18/84 1510.0 edit Mun

Allen Park Clay Mine
Ground Water Monitoring Data
Drinking Water and Water Quality Parameters
Well: 5-D Up Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	605.12	605.45	604.84
Arsenic	mg/l	<0.010	<0.001	<0.001
Barium	mg/l	0.060	<0.020	<0.050
Cadmium	mg/l	0.006	<0.003	<0.003
Chromium	mg/l	<0.005	0.015	0.019
Fluoride	mg/l	1.30	1.00	1.00
Lead	mg/l	0.010	<0.010	0.091
Mercury	mg/l	<0.0002	0.0005	<0.0002
Nitrate	mg/l	0.010	0.250	<0.010
Selenium	mg/l	<0.010	<0.010	<0.010
Silver	mg/l	0.003	<0.003	<0.005
Endrin	ug/l	<0.100	<0.100	<0.100
Lindane	ug/l	<0.100	<0.100	<0.100
Methoxychlor	ug/l	<0.500	<0.500	<0.500
Toxaphene	ug/l	<1.00	<1.00	<1.00
2,4-D	ug/l	<0.100	<0.100	<0.100
2,4,5-TP/Silvex	ug/l	<0.050	<0.050	<0.050
Radium	pCi/l	<2.00	<5.00	<5.00
Gross Alpha	pCi/l	<5.00	<5.00	<5.00
Gross Beta	pCi/l	<4.00	<4.00	<8.00
Coliform Bact.	co/100ml	<2.00	<4.00	4.00
Chloride	mg/l	140.	150.	140.
Iron	mg/l	1.70	1.20	0.880
Manganese	mg/l	0.023	0.015	0.005
Phenols	mg/l	<0.004	<0.004	<0.004
Sodium	mg/l	85.0	88.0	100.
Sulfate	mg/l	190.	200.	70.0

Time of Execution: 06/18/84 1510.0 edit Mon

Allen Park Clay Mine
Ground Water Monitoring Data
Drinking Water and Water Quality Parameters
Well: 102-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	603.22
Arsenic	mg/l	<0.0003
Barium	mg/l	<0.100
Cadmium	mg/l	<0.010
Chromium	mg/l	<0.010
Fluoride	mg/l	1.42
Lead	mg/l	<0.050
Mercury	mg/l	<0.0002
Nitrate	mg/l	<0.100
Selenium	mg/l	<0.0003
Silver	mg/l	<0.010
Endrin	ug/l	<0.0002
Lindane	ug/l	<0.004
Methoxychlor	ug/l	<0.010
Toxaphene	ug/l	<0.005
2,4-D	ug/l	<0.100
2,4,5-TP/Silvex	ug/l	<0.001
Radium	pCi/l	<5.00
Gross Alpha	pCi/l	<5.00
Gross Beta	pCi/l	<5.00
Coliform Bact.	co/100ml	4.00
Chloride	mg/l	130.
Iron	mg/l	<0.030
Manganese	mg/l	<0.010
Phenols	mg/l	<0.005
Sodium	mg/l	100.
Sulfate	mg/l	1200.

Time of Execution: 06/18/84 1510.0 edt Mon

Allen Park Clay Mine

Ground Water Monitoring Data

Drinking Water and Water Quality Parameters

Well: 102-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	601.77	601.66	599.15
Arsenic	mg/l	<0.010	<0.001	<0.001
Barium	mg/l	<0.040	<0.020	<0.100
Cadmium	mg/l	0.008	<0.003	<0.003
Chromium	mg/l	<0.065	0.006	0.006
Fluoride	mg/l	1.30	1.00	1.00
Lead	mg/l	0.010	<0.010	0.010
Mercury	mg/l	<0.0002	<0.0002	<0.0002
Nitrate	mg/l	<0.010	0.270	<0.010
Selenium	mg/l	<0.016	<0.010	<0.010
Silver	mg/l	0.066	0.004	0.005
Endrin	ug/l	<0.100	<0.100	<0.100
Lindane	ug/l	<0.100	<0.100	<0.100
Methoxychlor	ug/l	<0.050	<0.500	<0.500
Toxaphene	ug/l	<1.00	<1.00	<1.00
2,4-D	ug/l	<0.100	<0.100	<0.100
2,4,5-TF/Silvex	ug/l	0.050	<0.050	<0.050
Radium	pCi/l	<5.00	<5.00	<5.00
Gross Alpha	pCi/l	<5.00	<5.00	<5.00
Gross Beta	pCi/l	<8.00	<4.00	<8.00
Coliform Bact.	co/100ml	<2.00	<4.00	<2.20
Chloride	mg/l	140.	140.	140.
Iron	mg/l	0.538	5.10	1.20
Manganese	mg/l	0.023	0.041	0.016
Phenols	mg/l	<0.004	<0.004	<0.004
Sodium	mg/l	95.0	97.0	200.
Sulfate	mg/l	910.	960.	810.

Time of Execution: 06/18/84 1510.0 edit Mon

Allen Park Clay Mine

Ground Water Monitoring Data

Drinking Water and Water Quality Parameters

Well: 103-D Down Gradient

Date Sampled: 08-18-81

Parameter	Units	
Static	Feet	603.52
Arsenic	mg/l	<0.0003
Barium	mg/l	<0.100
Cadmium	mg/l	<0.010
Chromium	mg/l	<0.010
Fluoride	mg/l	1.31
Lead	mg/l	<0.050
Mercury	mg/l	<0.0002
Nitrate	mg/l	<0.100
Selenium	mg/l	<0.0003
Silver	mg/l	<0.010
Endrin	ug/l	<0.0002
Lindane	ug/l	<0.004
Methoxychlor	ug/l	<0.010
Toxaphene	ug/l	<0.005
2,4-D	ug/l	<0.100
2,4,5-TP/Silver	ug/l	<0.001
Radium	pCi/l	<5.00
Gross Alpha	pCi/l	<5.00
Gross Beta	pCi/l	<5.00
Coliform Bact.	co/100ml	<2.00
Chloride	mg/l	25.0
Iron	mg/l	<0.030
Manganese	mg/l	<0.010
Phenols	mg/l	<0.005
Sodium	mg/l	6.00
Sulfate	mg/l	46.0

Time of Execution: 06/18/84 1510.0 edit Mon

Allen Park Clay Mine

Ground Water Monitoring Data

Drinking Water and Water Quality Parameters

Well: 103-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	603.65	601.23	601.26
Arsenic	mg/l	<0.001	<0.001	<0.001
Barium	mg/l	<0.020	<0.020	<0.020
Cadmium	mg/l	0.007	0.008	<0.003
Chromium	mg/l	0.020	<0.004	<0.005
Fluoride	mg/l	1.50	1.00	1.00
Lead	mg/l	<0.010	<0.010	<0.010
Mercury	mg/l	<0.0002	<0.0002	<0.0002
Nitrate	mg/l	<0.010	0.050	<0.010
Selenium	mg/l	<0.010	<0.010	<0.010
Silver	mg/l	0.005	0.003	0.007
Endrin	ug/l	<0.100	<0.100	<0.100
Lindane	ug/l	<0.100	<0.100	<0.100
Methoxychlor	ug/l	<0.500	<0.500	<0.500
Toxaphene	ug/l	<1.00	<1.00	<1.00
2,4-D	ug/l	<0.100	<0.100	<0.100
2,4,5-TP/Silver	ug/l	<0.050	<0.050	<0.050
Radium	pCi/l	<2.00	<5.00	<5.00
Gross Alpha	pCi/l	<3.00	<5.00	<5.00
Gross Beta	pCi/l	<4.00	<4.00	<8.00
Coliform Bact.	co/100ml	<2.00	<4.00	5.10
Chloride	mg/l	130.	140.	130.
Iron	mg/l	1.00	0.900	6.00
Manganese	mg/l	0.023	0.018	0.037
Phenols	mg/l	<0.004	0.006	<0.004
Sodium	mg/l	8.70	85.0	160.
Sulfate	mg/l	760.	790.	840.

Time of Execution: 06/18/84 1510.0 edit Mon

Allen Park Clay Mine

Ground Water Monitoring Data

Drinking Water and Water Quality Parameters

Well: 104-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	603.81
Arsenic	mg/l	<0.0003
Barium	mg/l	<0.100
Cadmium	mg/l	<0.010
Chromium	mg/l	<0.010
Fluoride	mg/l	1.31
Lead	mg/l	<0.050
Mercury	mg/l	<0.0002
Nitrate	mg/l	<0.100
Selenium	mg/l	<0.0003
Silver	mg/l	<0.010
Endrin	ug/l	<0.0002
Lindane	ug/l	<0.004
Methoxychlor	ug/l	<0.010
Toxaphene	ug/l	<0.005
2,4-D	ug/l	<0.100
2,4,5-TP/Silvex	ug/l	<0.001
Radium	pCi/l	<5.00
Gross Alpha	pCi/l	<5.00
Gross Beta	pCi/l	<5.00
Coliform Bact.	co/100ml	4.00
Chloride	mg/l	140.
Iron	mg/l	<0.030
Manganese	mg/l	0.060
Phenols	mg/l	<0.005
Sodium	mg/l	100.
Sulfate	mg/l	1350.

Time of Execution: 08/18/84 1510.0 edt Mon

Allen Park Clay Mine

Ground Water Monitoring Data

Drinking Water and Water Quality Parameters

Well: 104-B Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	604.32	604.32	604.12
Arsenic	mg/l	<0.001	<0.010	<0.001
Barium	mg/l	<0.040	<0.020	<0.100
Cadmium	mg/l	0.010	<0.003	<0.003
Chromium	mg/l	<0.005	0.012	0.013
Fluoride	mg/l	1.00	0.900	1.00
Lead	mg/l	<0.010	<0.010	0.020
Mercury	mg/l	<0.0002	<0.002	<0.0002
Nitrate	mg/l	<0.010	0.230	0.250
Selenium	mg/l	<0.010	0.010	<0.010
Silver	mg/l	0.009	0.004	0.012
Endrin	ug/l	<0.100	<0.100	<0.100
Lindane	ug/l	<0.100	<0.100	<0.100
Methoxychor	ug/l	<0.500	<0.500	<0.500
Toxaphene	ug/l	<1.00	<1.00	<1.00
2,4-D	ug/l	<0.100	<0.100	<0.100
2,4,5-TP/Silver	ug/l	<0.050	<0.050	<0.050
Radium	pCi/l	<5.00	<5.00	<5.00
Gross Alpha	pCi/l	<3.00	<3.00	<5.00
Gross Beta	pCi/l	<4.00	<4.00	11.0
Coliform Bact.	co/100ml	<2.00	8.00	9.20
Chloride	mg/l	150.	160.	140.
Iron	mg/l	4.30	9.90	52.0
Manganese	mg/l	0.060	0.042	0.100
Phenols	mg/l	<0.004	<0.004	<0.004
Sodium	mg/l	100.	88.0	210.
Sulfate	mg/l	1200.	1300.	1200.

Time of Execution: 06/18/84 1510.0 edit Men

Table 2

Allen Park Clay Mine
Ground Water Monitoring Data
Contamination Indicating Parameters
Well: 2-D Down Gradient

* * Well Background Sampling Data * *

Date Sampled:		08-10-81	05-06-82	07-14-82	10-26-82
Parameter	Units				
Static	Feet	600.67	599.01	600.68	600.68
pH1		7.70	6.91	7.75	8.70
pH2		7.90	6.95	7.76	8.70
pH3		8.00	7.01	7.73	8.70
pH4		8.00	7.09	7.76	8.70
Number of Samples		4	4	4	4
Mean Value		7.90	6.99	7.75	8.70
Variance		2.00E-02	6.13E-03	2.00E-04	0.00E+00
Sp.Cond1	umhos/cm	2500.	2295.	3054.	2256.
Sp.Cond2	umhos/cm	2200.	2085.	2983.	2244.
Sp.Cond3	umhos/cm	2400.	2187.	2980.	2252.
Sp.Cond4	umhos/cm	2200.	2127.	2875.	2250.
Number of Samples		4	4	4	4
Mean Value		2325.0	2173.5	2973.0	2250.5
Variance		2.25E+04	8.31E+03	5.44E+03	2.50E+01
TOC1	mg/l	7.70	20.0	3.00	15.0
TOC2	mg/l	7.00	20.0	5.00	20.0
TOC3	mg/l	7.70	19.0	5.00	17.0
TOC4	mg/l	7.60	19.0	5.00	16.0
Number of Samples		4	4	4	4
Mean Value		7.50	19.50	4.50	17.00
Variance		1.13E-01	3.33E-01	1.00E+00	4.67E+00
TOX1	mg/l	<0.005	0.012	0.029	0.010
TOX2	mg/l	<0.005	0.016	0.033	0.017
TOX3	mg/l	<0.005	0.015	0.046	0.026
TOX4	mg/l	<0.005	0.014	0.027	0.038
Number of Samples		4	4	4	4
Mean Value		0.005	0.014	0.034	0.023
Variance		0.00E+00	2.92E-06	7.29E-05	1.46E-04

Summary of Background Data

Parameter	Mean Value	Variance	Number of Samples
pH:	7.84	3.98E-01	16
Sp.Cond:	2430.5	1.15E+05	16
TOC:	12.13	4.33E+01	16
TOX:	0.019	1.64E-04	16

Time of Execution: 02/23/83 0730.2 est Wed

Table 2 (Cont.)

Allen Park Clay Mine

Ground Water Monitoring Data

Contamination Indicating Parameters

Well: 102-D Down Gradient

* * Well Background Sampling Data * *

Date Sampled: 08-10-81 05-06-82 07-14-82 10-26-82

Parameter	Units				
Static	Feet	603.22	601.77	601.68	599.15
pH1		8.40	7.30	7.20	8.70
pH2			7.30	7.20	8.70
pH3			7.30	7.20	8.70
pH4			7.30	7.30	8.70
Number of Samples		1	4	4	4
Mean Value		8.40	7.30	7.22	8.70
Variance		0.00E+00	6.36E-07	2.50E-03	0.00E+00
Sp.Cond1	umhos/cm	2500.	2993.	2524.	2392.
Sp.Cond2	umhos/cm		2997.	2664.	2398.
Sp.Cond3	umhos/cm		2973.	2651.	2358.
Sp.Cond4	umhos/cm		2940.	2630.	2378.
Number of Samples		1	4	4	4
Mean Value		2500.0	2975.8	2617.3	2381.5
Variance		0.00E+00	6.78E+02	4.06E+03	3.16E+02
TOC1	mg/l	5.60	9.00	21.0	16.0
TOC2	mg/l		12.0	15.0	24.0
TOC3	mg/l		11.0	17.0	23.0
TOC4	mg/l		13.0	19.0	16.0
Number of Samples		1	4	4	4
Mean Value		5.60	11.25	18.00	19.75
Variance		0.00E+00	2.92E+00	6.67E+00	1.89E+01
TOX1	mg/l	0.008	0.011	0.035	0.015
TOX2	mg/l		0.006	0.010	0.010
TOX3	mg/l		0.006	0.010	0.016
TOX4	mg/l		0.007	0.010	0.013
Number of Samples		1	4	4	4
Mean Value		0.008	0.008	0.016	0.014
Variance		0.00E+00	5.67E-06	1.56E-04	7.00E-06

Summary of Background Data

Parameter	Mean Value	Variance	Number of Samples
pH:	7.79	4.94E-01	13
Sp.Cond:	2646.0	6.29E+04	13
TOC:	15.51	2.94E+01	13
TOX:	0.012	5.71E-05	13

Time of Execution: 02/23/83 0730.2 est Wed

Table 2 (Cont.)

Allen Park Clay Mine

Ground Water Monitoring Data

Contamination Indicating Parameters

Well: 103-D Down Gradient

* * Well Background Sampling Data * *

Date Sampled: 08-10-81 05-06-82 07-14-82 10-26-82

Parameter	Units				
Static	Feet	603.52	603.65	601.23	601.26
pH1		8.60	7.02	7.70	8.70
pH2			7.09	7.70	8.70
pH3			7.11	7.70	8.70
pH4			7.12	7.70	8.70
Number of Samples		1	4	4	4
Mean Value		8.60	7.09	7.70	8.70
Variance		0.00E+00	2.03E-03	0.00E+00	0.00E+00
Sp.Cond1	umhos/cm	300.	2622.	2441.	2352.
Sp.Cond2	umhos/cm		2604.	2468.	2308.
Sp.Cond3	umhos/cm		2583.	2450.	2294.
Sp.Cond4	umhos/cm		2616.	2438.	2288.
Number of Samples		1	4	4	4
Mean Value		300.0	2606.3	2449.3	2310.5
Variance		0.00E+00	2.96E+02	1.82E+02	8.36E+02
TOC1	mg/l	5.60	4.00	12.0	26.0
TOC2	mg/l		5.00	14.0	21.0
TOC3	mg/l		6.00	14.0	22.0
TOC4	mg/l		6.00	9.00	21.0
Number of Samples		1	4	4	4
Mean Value		5.60	5.25	12.25	22.50
Variance		0.00E+00	9.17E-01	5.58E+00	5.67E+00
TOX1	mg/l	0.029	<0.005	0.010	0.010
TOX2	mg/l		<0.005	0.054	0.010
TOX3	mg/l		<0.005	0.010	0.014
TOX4	mg/l		<0.005	0.010	<0.010
Number of Samples		1	4	4	4
Mean Value		0.029	0.005	0.021	0.011
Variance		0.00E+00	0.00E+00	4.84E-04	4.00E-06

Summary of Background Data

Parameter	Mean Value	Variance	Number of Samples
pH:	7.89	4.89E-01	13
Sp.Cond:	2289.5	3.72E+05	13
TOC:	12.74	5.78E+01	13
TOX:	0.014	1.87E-04	13

Time of Execution: 02/23/83 0749.7 est Wed

Table 2 (Cont.)

Allen Park Clay Mine

Ground Water Monitoring Data

Contamination Indicating Parameters

Well: 104-D Down Gradient

* * Well Background Sampling Data * *

Date Sampled: 08-10-81 05-06-82 07-14-82 10-26-82

Parameter Units

Static	Feet	603.81	604.32	604.32	604.12
pH1		8.00	6.89	7.70	8.30
pH2			6.90	7.68	8.20
pH3			6.91	7.68	8.20
pH4			6.90	7.67	8.20
Number of Samples		1	4	4	4
Mean Value		8.00	6.90	7.68	8.23
Variance		0.00E+00	6.61E-05	1.58E-04	2.50E-03
Sp.Cond1	umhos/cm	2550.	1980.	2817.	2698.
Sp.Cond2	umhos/cm		1960.	2885.	2862.
Sp.Cond3	umhos/cm		1980.	2885.	2838.
Sp.Cond4	umhos/cm		1920.	2852.	2871.
Number of Samples		1	4	4	4
Mean Value		2550.0	1960.0	2859.6	2867.3
Variance		0.00E+00	6.00E+02	1.05E+03	6.14E+02
TOC1	mg/l	6.60	7.00	6.00	11.0
TOC2	mg/l		10.0	12.0	15.0
TOC3	mg/l		8.00	14.0	10.0
TOC4	mg/l		8.00	12.0	12.0
Number of Samples		1	4	4	4
Mean Value		6.60	8.25	11.00	12.00
Variance		0.00E+00	1.58E+00	1.20E+01	4.67E+00
TOX1	mg/l	<0.005	<0.005	0.010	0.024
TOX2	mg/l		<0.005	0.024	0.018
TOX3	mg/l		<0.005	0.010	0.010
TOX4	mg/l		<0.005	0.046	0.020
Number of Samples		1	4	4	4
Mean Value		0.005	0.005	0.023	0.018
Variance		0.00E+00	0.00E+00	3.21E-04	3.47E-05

Summary of Background Data

Parameter	Mean Value	Variance	Number of Samples
pH:	7.63	3.69E-01	13
Sp.Cond:	2561.4	1.82E+05	13
TOC:	10.12	8.20E+00	13
TOX:	0.015	1.55E-04	13

Time of Execution: 02/23/83 0730.2 est Wed

Table 2 (Cont.)

Allen Park Clay Mine
Ground Water Monitoring Data
Contamination Indicating Parameters
Well: 5-D Up Gradient

* * Well Background Sampling Data * *

Date Sampled: 02-12-81 05-04-82 07-14-82 10-23-82

Parameter	Units				
Static	Feet	605.89	605.12	605.45	604.64
pH1		9.66	7.32	7.44	10.2
pH2			7.26	7.50	10.2
pH3			7.31	7.67	10.2
pH4			7.32	7.60	10.2
Number of Samples		1	4	4	4
Mean Value		9.60	7.31	7.55	10.20
Variance		0.00E+00	3.58E-04	1.45E-02	0.00E+00
Sp. Cond1	umhos/cm	1050.	2150.	1990.	1700.
Sp. Cond2	umhos/cm		2109.	1918.	1800.
Sp. Cond3	umhos/cm		2121.	1939.	1791.
Sp. Cond4	umhos/cm		2100.	1950.	1800.
Number of Samples		1	4	4	4
Mean Value		1050.0	2122.0	1950.3	1800.0
Variance		0.00E+00	6.99E+02	9.20E+02	1.19E+03
TOL1	mg/l	9.00	6.00	21.0	21.0
TOL2	mg/l		5.00	18.0	20.0
TOL3	mg/l		5.00	18.0	9.00
TOL4	mg/l		6.00	20.0	33.0
Number of Samples		1	4	4	4
Mean Value		9.00	5.50	18.25	20.75
Variance		0.00E+00	3.33E-01	2.25E+00	9.63E+01
TOX1	mg/l		0.006	0.064	0.021
TOX2	mg/l		0.010	0.032	0.041
TOX3	mg/l		0.009	0.024	0.025
TOX4	mg/l		0.008	0.026	0.032
Number of Samples		0	4	4	4
Mean Value			0.008	0.037	0.030
Variance			2.92E-06	3.48E-04	7.69E-05

Summary of Background Data

Parameter	Mean Value	Variance	Number of Samples
pH:	8.45	1.84E+00	13
Sp. Cond:	1929.8	3.81E+04	13
TOL:	14.09	7.47E+01	13
TOX:	0.020	2.70E-04	12

Allen Park Clay Mine
 Ground Water Monitoring Data
 Additional Water Quality Parameters
 Well: 2-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	600.67
COD	mg/l	2.60
Iron	mg/l	<0.030
Chloride	mg/l	150.
Sulfate	mg/l	1050.
Sp. Conductance	umhos/cm	2500.
Sp. Conductance	umhos/cm	2400.
Sp. Conductance	umhos/cm	2200.
Sp. Conductance	umhos/cm	2200.
pH 1		7.70
pH 2		8.00
pH 3		7.90
pH 4		8.00
TOC 1	mg/l	7.70
TOC 2	mg/l	7.00
TOC 3	mg/l	7.70
TOC 4	mg/l	7.60
Calcium	mg/l	200.
Sodium	mg/l	110.
Magnesium	mg/l	160.
Bicarbonate	mg/l	200.
Ammonia-Nitrogen	mg/l	0.500
Nitrogen-Nitrate	mg/l	<0.100
Nitrogen-Nitrite	mg/l	0.002
Phenols	mg/l	0.008
Chromium	mg/l	<0.010
Cadmium	mg/l	0.240
Lead	mg/l	<0.050
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 2-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	599.01	600.68	600.68
COD	mg/l			
Iron	mg/l	5.10	0.840	0.450
Chloride	mg/l	150.	170.	170.
Sulfate	mg/l	1050.	1000.	880.
Sp. Conductance	umhos/cm	2295.	3054.	2256.
Sp. Conductance	umhos/cm	2085.	2983.	2244.
Sp. Conductance	umhos/cm	2187.	2980.	2252.
Sp. Conductance	umhos/cm	2127.	2875.	2250.
pH 1		6.91	7.75	8.70
pH 2		6.95	7.76	8.70
pH 3		7.01	7.73	8.70
pH 4		7.09	7.76	8.70
TOC 1	mg/l	20.0	3.00	15.0
TOC 2	mg/l	20.0	5.00	20.0
TOC 3	mg/l	19.0	5.00	17.0
TOC 4	mg/l	19.0	5.00	16.0
Calcium	mg/l			
Sodium	mg/l	120.	110.	240.
Magnesium	mg/l			
Bicarbonate	mg/l			
Ammonia-Nitrogen	mg/l			
Nitrogen-Nitrate	mg/l	<0.010	0.010	<0.010
Nitrogen-Nitrite	mg/l			
Phenols	mg/l	0.004	<0.004	<0.004
Chromium	mg/l	0.050	0.010	0.016
Cadmium	mg/l	0.023	0.006	<0.003
Lead	mg/l	0.093	0.030	<0.010
Napthalene	mg/l			

Time of Execution: 06/19/84 1040.3 edt Tue

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 2-D Down Gradient

Date Sampled: 04-26-83 08-24-83

Parameter	Units		
Static	Feet	600.74	600.67
COD	mg/l		110.
Iron	mg/l		2.20
Chloride	mg/l		190.
Sulfate	mg/l		1210.
Sp. Conductance	umhos/cm		2700.
Sp. Conductance	umhos/cm		2600.
Sp. Conductance	umhos/cm		2600.
Sp. Conductance	umhos/cm		2600.
pH 1			7.40
pH 2			7.40
pH 3			7.50
pH 4			7.60
TOC 1	mg/l		31.0
TOC 2	mg/l		14.0
TOC 3	mg/l		27.0
TOC 4	mg/l		32.0
Calcium	mg/l		340.
Sodium	mg/l		120.
Magnesium	mg/l		230.
Bicarbonate	mg/l		350.
Ammonia-Nitrogen	mg/l		1.10
Nitrogen-Nitrate	mg/l		0.040
Nitrogen-Nitrite	mg/l		<0.020
Phenols	mg/l		
Chromium	mg/l		<0.020
Cadmium	mg/l		
Lead	mg/l		0.440
Napthalene	mg/l		

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 2-D Down Gradient

Date Sampled: 04-17-84

Parameter	Units	
Static	Feet	586.97
COD	mg/l	119.
Iron	mg/l	3.38
Chloride	mg/l	170.
Sulfate	mg/l	2600.
Sp. Conductance	umhos/cm	2600.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.60
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	11.8
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	280.
Sodium	mg/l	119.
Magnesium	mg/l	150.
Bicarbonate	mg/l	320.
Ammonia-Nitrogen	mg/l	0.630
Nitrogen-Nitrate	mg/l	0.020
Nitrogen-Nitrite	mg/l	0.020
Phenols	mg/l	
Chromium	mg/l	0.020
Cadmium	mg/l	
Lead	mg/l	
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 5-D Up Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	605.89
COD	mg/l	3.80
Iron	mg/l	<0.030
Chloride	mg/l	126.
Sulfate	mg/l	240.
Sp. Conductance	umhos/cm	1550.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		9.60
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	9.88
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	10.0
Sodium	mg/l	100.
Magnesium	mg/l	160.
Bicarbonate	mg/l	675.
Ammonia-Nitrogen	mg/l	0.300
Nitrogen-Nitrate	mg/l	<0.002
Nitrogen-Nitrite	mg/l	<0.100
Phenols	mg/l	0.021
Chromium	mg/l	<0.010
Cadmium	mg/l	<0.020
Lead	mg/l	0.050
Napthalene	mg/l	

Time of Execution: 06/19/84 1140.3 ed: Tue

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 5-D Up Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	605.12	605.45	604.84
COD	mg/l			
Iron	mg/l	1.70	1.20	0.880
Chloride	mg/l	140.	150.	140.
Sulfate	mg/l	190.	200.	70.0
Sp. Conductance	umhos/cm	2160.	1990.	1785.
Sp. Conductance	umhos/cm	2109.	1918.	1800.
Sp. Conductance	umhos/cm	2121.	1939.	1791.
Sp. Conductance	umhos/cm	2100.	1954.	1860.
pH 1		7.32	7.44	10.2
pH 2		7.28	7.50	10.2
pH 3		7.31	7.67	10.2
pH 4		7.32	7.60	10.2
TOC 1	mg/l	6.00*	21.0	21.0
TOC 2	mg/l	5.00	18.0	20.0
TOC 3	mg/l	5.00	13.0	9.00
TOC 4	mg/l	6.00	20.0	33.0
Calcium	mg/l			
Sodium	mg/l	85.0	88.0	180.
Magnesium	mg/l			
Bicarbonate	mg/l			
Ammonia-Nitrogen	mg/l			
Nitrogen-Nitrate	mg/l	0.010	0.250	<0.010
Nitrogen-Nitrite	mg/l			
Phenols	mg/l	<0.004	<0.004	<0.004
Chromium	mg/l	<0.005	0.016	0.019
Cadmium	mg/l	0.006	<0.003	<0.003
Lead	mg/l	0.010	<0.010	0.091
Napthalene	mg/l			

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 5-D Up Gradient

Date Sampled: 04-26-83 08-24-83

Parameter	Units		
Static	Feet	604.24	605.44
COD	mg/l		27.0
Iron	mg/l		1.70
Chloride	mg/l		100.
Sulfate	mg/l		190.
Sp. Conductance	umhos/cm		1600.
Sp. Conductance	umhos/cm		1600.
Sp. Conductance	umhos/cm		1600.
Sp. Conductance	umhos/cm		1600.
pH 1			8.00
pH 2			8.00
pH 3			8.00
pH 4			8.00
TOC 1	mg/l		7.00
TOC 2	mg/l		11.0
TOC 3	mg/l		9.00
TOC 4	mg/l		8.00
Calcium	mg/l		38.0
Sodium	mg/l		110.
Magnesium	mg/l		240.
Bicarbonate	mg/l		600.
Ammonia-Nitrogen	mg/l		0.830
Nitrogen-Nitrate	mg/l		0.020
Nitrogen-Nitrite	mg/l		0.020
Phenols	mg/l		
Chromium	mg/l		0.020
Cadmium	mg/l		
Lead	mg/l		0.100
Napthalene	mg/l		

Time of Execution: 06/19/84 1848.3 edt Tue

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: S-0 Up Gradient

Date Sampled: 04-17-84

Parameter	Units	
Static	Feet	603.93
COI	mg/l	<4.00
Iron	mg/l	0.110
Chloride	mg/l	150.
Sulfate	mg/l	300.
Sp. Conductance	umhos/cm	1700.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		9.30
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	3.00
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	11.0
Sodium	mg/l	110.
Magnesium	mg/l	160.
Bicarbonate	mg/l	450.
Ammonia-Nitrogen	mg/l	0.600
Nitrogen-Nitrate	mg/l	<0.020
Nitrogen-Nitrite	mg/l	<0.020
Phenols	mg/l	
Chromium	mg/l	<0.020
Cadmium	mg/l	
Lead	mg/l	
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 7-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	591.81
CO ₂	mg/l	1.90
Iron	mg/l	0.030
Chloride	mg/l	150.
Sulfate	mg/l	1300.
Sp. Conductance	umhos/cm	2250.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		10.0
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	7.00
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	370.
Sodium	mg/l	120.
Magnesium	mg/l	24.0
Bicarbonate	mg/l	0.0000
Ammonia-Nitrogen	mg/l	0.750
Nitrogen-Nitrate	mg/l	0.100
Nitrogen-Nitrite	mg/l	0.002
Phenols	mg/l	0.023
Chromium	mg/l	0.010
Cadmium	mg/l	0.020
Lead	mg/l	0.050
Napthalene	mg/l	

Time of Execution: 06/19/84 1040.3 edr Tue

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 7-D Down Gradient

Date Sampled: 05-06-82 07-14-82 11-26-82

Parameter	Units			
Static	Feet	589.60	582.06	586.35
COD	mg/l	200.	160.	260.
Iron	mg/l	3.30	20.0	3.40
Chloride	mg/l		160.	140.
Sulfate	mg/l	850.	1000.	880.
Sp. Conductance	umhos/cm	1800.	2664.	2435.
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
pH 1		9.80	10.0	10.0
pH 2				
pH 3				
pH 4				
TOC 1	mg/l	85.0	31.0	49.0
TOC 2	mg/l			
TOC 3	mg/l			
TOC 4	mg/l			
Calcium	mg/l	270.		
Sodium	mg/l			260.
Magnesium	mg/l	48.0		
Bicarbonate	mg/l	39.0		
Ammonia-Nitrogen	mg/l			0.630
Nitrogen-Nitrate	mg/l			0.080
Nitrogen-Nitrite	mg/l			0.020
Phenols	mg/l			
Chromium	mg/l	0.020		
Cadmium	mg/l			
Lead	mg/l			0.440
Napthalene	mg/l			

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 7-D Down Gradient

Date Sampled: 08-24-83

Parameter	Units	
Static	Feet	592.05
COD	mg/l	160.
Iron	mg/l	14.0
Chloride	mg/l	180.
Sulfate	mg/l	1160.
Sp. Conductance	umhos/cm	2200.
Sp. Conductance	umhos/cm	2200.
Sp. Conductance	umhos/cm	2200.
Sp. Conductance	umhos/cm	2200.
pH 1		10.6
pH 2		10.8
pH 3		10.8
pH 4		10.8
TOC 1	mg/l	49.0
TOC 2	mg/l	28.0
TOC 3	mg/l	42.0
TOC 4	mg/l	21.0
Calcium	mg/l	450.
Sodium	mg/l	150.
Magnesium	mg/l	18.0
Bicarbonate	mg/l	40.0
Ammonia-Nitrogen	mg/l	0.940
Nitrogen-Nitrate	mg/l	0.040
Nitrogen-Nitrite	mg/l	<0.020
Phenols	mg/l	
Chromium	mg/l	<0.020
Cadmium	mg/l	
Lead	mg/l	1.00
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 7-D Down Gradient

Date Sampled: 04-17-84

Parameter	Units	
Static	Feet	592.84
COD	mg/l	130.
Iron	mg/l	0.530
Chloride	mg/l	128.
Sulfate	mg/l	2500.
Sp. Conductance	umhos/cm	2400.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		9.90
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	35.0
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	280.
Sodium	mg/l	110.
Magnesium	mg/l	15.0
Bicarbonate	mg/l	0.0000
Ammonia-Nitrogen	mg/l	0.900
Nitrogen-Nitrate	mg/l	0.020
Nitrogen-Nitrite	mg/l	0.020
Phenols	mg/l	
Chromium	mg/l	0.020
Cadmium	mg/l	
Lead	mg/l	
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 10-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	601.01
COD	mg/l	7.00
Iron	mg/l	0.246
Chloride	mg/l	150.
Sulfate	mg/l	2100.
Sp. Conductance	umhos/cm	3000.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.80
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	7.00
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	370.
Sodium	mg/l	90.0
Magnesium	mg/l	200.
Bicarbonate	mg/l	225.
Ammonia-Nitrogen	mg/l	0.500
Nitrogen-Nitrate	mg/l	10.100
Nitrogen-Nitrite	mg/l	0.002
Phenols	mg/l	0.009
Chromium	mg/l	0.010
Cadmium	mg/l	0.020
Lead	mg/l	0.050
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 10-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	601.28	588.03	596.63
COD	mg/l	140.	300.	230.
Iron	mg/l	4.30	0.520	5.90
Chloride	mg/l		160.	140.
Sulfate	mg/l	1800.	1900.	1600.
Sp. Conductance	umhos/cm	3240.	1238.	2890.
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
pH 1		7.20	7.94	9.10
pH 2				
pH 3				
pH 4				
TOC 1	mg/l	27.0	68.0	21.0
TOC 2	mg/l			
TOC 3	mg/l			
TOC 4	mg/l			
Calcium	mg/l	290.		
Sodium	mg/l			210.
Magnesium	mg/l	220.		
Bicarbonate	mg/l	200.		
Ammonia-Nitrogen	mg/l			0.550
Nitrogen-Nitrate	mg/l			0.040
Nitrogen-Nitrite	mg/l			0.010
Phenols	mg/l			
Chromium	mg/l	0.010		
Cadmium	mg/l			
Lead	mg/l			0.050
Napthalene	mg/l			

Time of Execution: 06/19/84 1040.3 ed: Tue

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 10-D Down Gradient

Date Sampled: 04-26-83 08-24-83

Parameter	Units
Static	Feet 598.45
COD	mg/l
Iron	mg/l
Chloride	mg/l
Sulfate	mg/l
Sp. Conductance	umhos/cm
Sp. Conductance	umhos/cm
Sp. Conductance	umhos/cm
Sp. Conductance	umhos/cm
pH 1	
pH 2	
pH 3	
pH 4	
TOC 1	mg/l
TOC 2	mg/l
TOC 3	mg/l
TOC 4	mg/l
Calcium	mg/l
Sodium	mg/l
Magnesium	mg/l
Bicarbonate	mg/l
Ammonia-Nitrogen	mg/l
Nitrogen-Nitrate	mg/l
Nitrogen-Nitrite	mg/l
Phenols	mg/l
Chromium	mg/l
Cadmium	mg/l
Lead	mg/l
Napthalene	mg/l

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 101-D Down Gradient

Date Sampled 04-17-84

Parameter	Units	
Static	Feet	575.92
COD	mg/l	190.
Iron	mg/l	27.0
Chloride	mg/l	150.
Sulfate	mg/l	2600.
Sp. Conductance	umhos/cm	2400.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.40
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	19.0
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	180.
Sodium	mg/l	120.
Magnesium	mg/l	150.
Bicarbonate	mg/l	200.
Ammonia-Nitrogen	mg/l	0.050
Nitrogen-Nitrate	mg/l	0.020
Nitrogen-Nitrite	mg/l	0.030
Phenols	mg/l	
Chromium	mg/l	0.020
Cadmium	mg/l	
Lead	mg/l	
Napthalene	mg/l	

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 101-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	601.21
COD	mg/l	1.60
Iron	mg/l	0.030
Chloride	mg/l	135.
Sulfate	mg/l	1250.
Sp. Conductance	umhos/cm	2400.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.10
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	11.0
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	190.
Sodium	mg/l	120.
Magnesium	mg/l	140.
Bicarbonate	mg/l	
Ammonia-Nitrogen	mg/l	0.500
Nitrogen-Nitrate	mg/l	<0.100
Nitrogen-Nitrite	mg/l	0.004
Phenols	mg/l	
Chromium	mg/l	0.010
Cadmium	mg/l	
Lead	mg/l	0.050
Napthalene	mg/l	

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 101-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	597.89	597.81	599.77
COD	mg/l	200.	210.	250.
Iron	mg/l	2.20	0.940	3.60
Chloride	mg/l		150.	140.
Sulfate	mg/l	1000.	1000.	900.
Sp. Conductance	umhos/cm	2802.	2207.	2204.
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
pH 1		7.10	7.62	8.60
pH 2				
pH 3				
pH 4				
TOC 1	mg/l	60.0	44.0	43.0
TOC 2	mg/l			
TOC 3	mg/l			
TOC 4	mg/l			
Calcium	mg/l	180.		
Sodium	mg/l			240.
Magnesium	mg/l	160.		
Bicarbonate	mg/l	130.		
Ammonia-Nitrogen	mg/l			0.500
Nitrogen-Nitrate	mg/l			0.070
Nitrogen-Nitrite	mg/l			<0.010
Phenols	mg/l			
Chromium	mg/l	0.010		
Cadmium	mg/l			
Lead	mg/l			0.110
Napthalene	mg/l			

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 101-D Down Gradient

Date Sampled: 08-24-83

Parameter	Units	
Static	Feet	600.26
COD	mg/l	90.0
Iron	mg/l	17.0
Chloride	mg/l	200.
Sulfate	mg/l	1360.
Sp. Conductance	umhos/cm	2200.
Sp. Conductance	umhos/cm	2200.
Sp. Conductance	umhos/cm	2200.
Sp. Conductance	umhos/cm	2200.
pH 1		7.70
pH 2		7.70
pH 3		7.70
pH 4		7.70
TDC 1	mg/l	17.0
TDC 2	mg/l	8.00
TDC 3	mg/l	22.0
TDC 4	mg/l	17.0
Calcium	mg/l	190.
Sodium	mg/l	150.
Magnesium	mg/l	238.
Bicarbonate	mg/l	170.
Ammonia-Nitrogen	mg/l	0.610
Nitrogen-Nitrate	mg/l	0.210
Nitrogen-Nitrite	mg/l	0.020
Phenols	mg/l	
Chromium	mg/l	0.020
Cadmium	mg/l	
Lead	mg/l	0.050
Napthalene	mg/l	

Down Gradient
Date Sampled 04-17-84

Parameter	Units	
Static	Feet	
COD	mg/l	575.92
Iron	mg/l	190.
Chloride	mg/l	27.0
Sulfate	mg/l	150
Sp. Conductance	umhos/cm	2600
Sp. Conductance	umhos/cm	2400.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		
pH 2		
pH 3		7.40
pH 4		
TDC 1	mg/l	
TDC 2	mg/l	19.0
TDC 3	mg/l	
TDC 4	mg/l	
Calcium	mg/l	
Sodium	mg/l	186.
Magnesium	mg/l	126.
Bicarbonate	mg/l	150.
Ammonia-Nitrogen	mg/l	200.
Nitrogen-Nitrate	mg/l	0.850
Nitrogen-Nitrite	mg/l	0.020
Phenols	mg/l	0.030
Chromium	mg/l	
Cadmium	mg/l	10.020
Lead	mg/l	
Nepthalene	mg/l	

Time of Execution: 06/15/84 0923.6 edr FPI -245-

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 102-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	603.22
COD	mg/l	0.600
Iron	mg/l	<0.030
Chloride	mg/l	130.
Sulfate	mg/l	1200.
Sp. Conductance	umhos/cm	2500.
Sp. Conductance	umhos/cm	2450.
Sp. Conductance	umhos/cm	2300.
Sp. Conductance	umhos/cm	2300.
pH 1		8.40
pH 2		8.10
pH 3		8.10
pH 4		8.10
TOC 1	mg/l	5.60
TOC 2	mg/l	6.00
TOC 3	mg/l	5.60
TOC 4	mg/l	6.60
Calcium	mg/l	160.
Sodium	mg/l	100.
Magnesium	mg/l	210.
Bicarbonate	mg/l	
Ammonia-Nitrogen	mg/l	0.500
Nitrogen-Nitrate	mg/l	<0.100
Nitrogen-Nitrite	mg/l	0.002
Phenols	mg/l	0.005
Chromium	mg/l	<0.010
Cadmium	mg/l	<0.010
Lead	mg/l	<0.050
Napthalene	mg/l	

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 102-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	601.77	601.66	599.15
COD	mg/l			
Iron	mg/l	0.530	5.10	1.20
Chloride	mg/l	140.	140.	140.
Sulfate	mg/l	910.	960.	810.
Sp. Conductance	umhos/cm	2993.	2524.	2392.
Sp. Conductance	umhos/cm	2997.	2664.	2398.
Sp. Conductance	umhos/cm	2973.	2651.	2358.
Sp. Conductance	umhos/cm	2940.	2638.	2378.
pH 1		7.30	7.20	8.70
pH 2		7.30	7.20	8.70
pH 3		7.30	7.20	8.70
pH 4		7.30	7.30	8.70
TOC 1	mg/l	9.00	21.0	16.0
TOC 2	mg/l	12.8	15.0	24.0
TOC 3	mg/l	11.0	19.0	23.0
TOC 4	mg/l	13.0	17.0	16.0
Calcium	mg/l			
Sodium	mg/l	95.0	97.0	200.
Magnesium	mg/l			
Bicarbonate	mg/l			
Ammonia-Nitrogen	mg/l			
Nitrogen-Nitrate	mg/l	<0.010	0.270	<0.010
Nitrogen-Nitrite	mg/l			
Phenols	mg/l	<0.004	0.004	0.004
Chromium	mg/l	<0.005	0.006	0.008
Cadmium	mg/l	0.008	<0.003	<0.003
Lead	mg/l	0.010	<0.010	<0.010
Napthalene	mg/l			

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 102-B Down Gradient

Date Sampled: 04-26-83 08-24-83

Parameter	Units		
Static	Feet	602.41	601.89
COD	mg/l		74.0
Iron	mg/l		19.0
Chloride	mg/l		170.
Sulfate	mg/l		1210.
Sp. Conductance	umhos/cm		2500.
Sp. Conductance	umhos/cm		2500.
Sp. Conductance	umhos/cm		2500.
Sp. Conductance	umhos/cm		2400.
pH 1			7.70
pH 2			7.60
pH 3			7.60
pH 4			7.70
TOC 1	mg/l		17.0
TOC 2	mg/l		16.0
TOC 3	mg/l		11.0
TOC 4	mg/l		9.00
Calcium	mg/l		160.
Sodium	mg/l		120.
Magnesium	mg/l		330.
Bicarbonate	mg/l		390.
Ammonia-Nitrogen	mg/l		0.940
Nitrogen-Nitrate	mg/l		0.030
Nitrogen-Nitrite	mg/l		<0.020
Phenols	mg/l		
Chromium	mg/l		<0.020
Cadmium	mg/l		
Lead	mg/l		<0.050
Napthalene	mg/l		

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 182-D Down Gradient

Date Sampled: 04-17-64

Parameter	Units	
Static	Feet	601.49
COD	mg/l	23.0
Iron	mg/l	7.00
Chloride	mg/l	39.0
Sulfate	mg/l	2500.
Sp. Conductance	umhos/cm	2500.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.20
pH 2		
pH 3		
pH 4		
TGC 1	mg/l	3.00
TGC 2	mg/l	
TGC 3	mg/l	
TGC 4	mg/l	
Calcium	mg/l	170.
Sodium	mg/l	95.0
Magnesium	mg/l	210.
Bicarbonate	mg/l	450.
Ammonia-Nitrogen	mg/l	1.00
Nitrogen-Nitrate	mg/l	<0.020
Nitrogen-Nitrite	mg/l	<0.020
Phenols	mg/l	
Chromium	mg/l	0.210
Cadmium	mg/l	
Lead	mg/l	
Naphthalene	mg/l	

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 103-D Down Gradient

Date Sampled: 08-10-81

<u>Parameter</u>	<u>Units</u>	
Static	Feet	603.52
COD	mg/l	1.60
Iron	mg/l	<0.030
Chloride	mg/l	25.0
Sulfate	mg/l	46.0
Sp. Conductance	umhos/cm	300.
Sp. Conductance	umhos/cm	300.
Sp. Conductance	umhos/cm	300.
Sp. Conductance	umhos/cm	300.
pH 1		8.60
pH 2		8.30
pH 3		8.40
pH 4		8.50
TOC 1	mg/l	5.60
TOC 2	mg/l	6.00
TOC 3	mg/l	5.60
TOC 4	mg/l	6.60
Calcium	mg/l	37.8
Sodium	mg/l	6.00
Magnesium	mg/l	6.20
Bicarbonate	mg/l	
Ammonia-Nitrogen	mg/l	0.400
Nitrogen-Nitrate	mg/l	<0.100
Nitrogen-Nitrite	mg/l	<0.002
Phenols	mg/l	<0.005
Chromium	mg/l	<0.010
Cadmium	mg/l	<0.010
Lead	mg/l	<0.050
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 103-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	603.65	601.23	601.20
COD	mg/l			
Iron	mg/l	1.00	8.900	6.00
Chloride	mg/l	130.	140.	130.
Sulfate	mg/l	760.	790.	840.
Sp. Conductance	umhos/cm	2622.	2441.	2352.
Sp. Conductance	umhos/cm	2604.	2468.	2308.
Sp. Conductance	umhos/cm	2583.	2450.	2294.
Sp. Conductance	umhos/cm	2616.	2438.	2288.
pH 1		7.02	7.70	8.70
pH 2		7.89	7.70	8.70
pH 3		7.11	7.70	8.70
pH 4		7.12	7.70	8.70
TOC 1	mg/l	4.00	12.0	26.0
TOC 2	mg/l	5.00	14.0	21.0
TOC 3	mg/l	6.00	14.0	22.0
TOC 4	mg/l	6.00	9.00	21.0
Calcium	mg/l			
Sodium	mg/l	8.70	85.0	160.
Magnesium	mg/l			
Bicarbonate	mg/l			
Ammonia-Nitrogen	mg/l			
Nitrogen-Nitrate	mg/l	<0.010	0.050	<0.010
Nitrogen-Nitrite	mg/l			
Phenols	mg/l	<0.004	0.006	
Chromium	mg/l	0.020	<0.004	<0.005
Cadmium	mg/l	0.007	4.008	<0.003
Lead	mg/l	<0.010	<0.010	<0.010
Napthalene	mg/l			

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 103-D Down Gradient

Date Sampled: 04-24-83 08-24-83

Parameter	Units		
Static	Feet	602.31	603.23
COD	mg/l		20.0
Iron	mg/l		1.70
Chloride	mg/l		170.
Sulfate	mg/l		970.
Sp. Conductance	umhos/cm		2300.
Sp. Conductance	umhos/cm		2200.
Sp. Conductance	umhos/cm		2200.
Sp. Conductance	umhos/cm		2200.
pH 1			8.00
pH 2			8.00
pH 3			7.90
pH 4			7.90
TOC 1	mg/l		11.0
TOC 2	mg/l		10.0
TOC 3	mg/l		17.0
TOC 4	mg/l		21.0
Calcium	mg/l		99.0
Sodium	mg/l		100.
Magnesium	mg/l		310.
Bicarbonate	mg/l		440.
Ammonia-Nitrogen	mg/l		0.740
Nitrogen-Nitrate	mg/l		0.030
Nitrogen-Nitrite	mg/l		<0.020
Phenols	mg/l		
Chromium	mg/l		<0.020
Cadmium	mg/l		
Lead	mg/l		<0.050
Napthalene	mg/l		

Allen Park Lloy Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 103-D Down Gradient

Date Sampled: 04-17-84

Parameter	Units	
Static	Feet	601.36
COD	mg/l	<4.00
Iron	mg/l	0.310
Chloride	mg/l	130.
Sulfate	mg/l	1900.
Sp. Conductance	umhos/cm	2300.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.50
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	4.00
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	73.0
Sodium	mg/l	90.0
Magnesium	mg/l	240.
Bicarbonate	mg/l	410.
Ammonia-Nitrogen	mg/l	0.000
Nitrogen-Nitrate	mg/l	<0.020
Nitrogen-Nitrite	mg/l	<0.020
Phenols	mg/l	
Chromium	mg/l	<0.020
Cadmium	mg/l	
Lead	mg/l	
Naphthalene	mg/l	

Time of Execution: 06/15/84 1425.8 sec (r)

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 104-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	603.81
COD	mg/l	1.00
Iron	mg/l	0.320
Chloride	mg/l	140.
Sulfate	mg/l	1350.
Sp. Conductance	umhos/cm	2550.
Sp. Conductance	umhos/cm	2500.
Sp. Conductance	umhos/cm	2400.
Sp. Conductance	umhos/cm	2400.
pH 1		8.00
pH 2		8.00
pH 3		8.00
pH 4		8.10
TOC 1	mg/l	6.00
TOC 2	mg/l	6.80
TOC 3	mg/l	6.60
TOC 4	mg/l	6.60
Calcium	mg/l	310.
Sodium	mg/l	100.
Magnesium	mg/l	180.
Bicarbonate	mg/l	
Ammonia-Nitrogen	mg/l	0.500
Nitrogen-Nitrate	mg/l	<0.100
Nitrogen-Nitrite	mg/l	<0.002
Phenols	mg/l	<0.005
Chromium	mg/l	<0.010
Cadmium	mg/l	<0.010
Lead	mg/l	<0.050
Napthalene	mg/l	

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 104-D Down Gradient

Date Sampled: 05-06-82 07-14-82

Parameter	Units		
Static	Feet	604.32	604.32
COD	mg/l		
Iron	mg/l	4.30	9.90
Chloride	mg/l	150.	160.
Sulfate	mg/l	1200.	1300.
Sp. Conductance	umhos/cm	1980.	2817.
Sp. Conductance	umhos/cm	1960.	2885.
Sp. Conductance	umhos/cm	1920.	2885.
Sp. Conductance	umhos/cm	1980.	2852.
pH 1		6.89	7.78
pH 2		6.90	7.66
pH 3		6.91	7.68
pH 4		6.90	7.67
TOC 1	mg/l	7.00	6.00
TOC 2	mg/l	10.0	12.0
TOC 3	mg/l	0.00	14.0
TOC 4	mg/l	8.00	12.0
Calcium	mg/l		
Sodium	mg/l	100.	88.0
Magnesium	mg/l		
Bicarbonate	mg/l		
Ammonia-Nitrogen	mg/l		
Nitrogen-Nitrate	mg/l	<0.010	0.230
Nitrogen-Nitrite	mg/l		
Phenols	mg/l	<0.004	<0.004
Chromium	mg/l	<0.005	0.012
Cadmium	mg/l	0.010	<0.003
Lead	mg/l	<0.010	<0.010
Napthalene	mg/l		

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 104-D Down Gradient

Date Sampled: 10-26-83 04-26-83 08-24-83

Parameter	Units			
Static	Feet	604.12	601.39	603.73
COD	mg/l			16.0
Iron	mg/l	52.0		17.0
Chloride	mg/l	140.		170.
Sulfate	mg/l	1200.		1580.
Sp. Conductance	umhos/cm	2898.		2800.
Sp. Conductance	umhos/cm	2862.		2800.
Sp. Conductance	umhos/cm	2838.		2800.
Sp. Conductance	umhos/cm	2871.		2800.
pH 1		8.30		7.60
pH 2		8.20		7.50
pH 3		8.20		7.40
pH 4		8.20		7.40
TOC 1	mg/l	11.0		8.00
TOC 2	mg/l	15.0		7.00
TOC 3	mg/l	10.0		7.00
TOC 4	mg/l	12.0		7.00
Calcium	mg/l			330.
Sodium	mg/l	210.		100.
Magnesium	mg/l			230.
Bicarbonate	mg/l			240.
Ammonia-Nitrogen	mg/l			0.830
Nitrogen-Nitrate	mg/l	0.250		0.380
Nitrogen-Nitrite	mg/l			<0.020
Phenols	mg/l	<0.004		
Chromium	mg/l	0.013		<0.020
Cadmium	mg/l	<0.003		
Lead	mg/l	0.020		<0.050
Napthalene	mg/l			

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 104-D South Gradient

Date Sampled: 04-17-84

Parameter	Units	
Static	Feet	603.84
COD	mg/l	<4.00
Iron	mg/l	4.20
Chloride	mg/l	158.
Sulfate	mg/l	3100.
Sp. Conductance	umhos/cm	2600.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.26
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	3.00
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	220.
Sodium	mg/l	186.
Magnesium	mg/l	186.
Bicarbonate	mg/l	220.
Ammonia-Nitrogen	mg/l	1.00
Nitrogen-Nitrate	mg/l	<0.020
Nitrogen-Nitrite	mg/l	<0.020
Phenols	mg/l	
Chromium	mg/l	<0.020
Cadmium	mg/l	
Lead	mg/l	
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 105-D Down Gradient

Date Sampled: 08-10-81

Parameter	Units	
Static	Feet	603.86
COD	mg/l	1.00
Iron	mg/l	1.40
Chloride	mg/l	145.
Sulfate	mg/l	1300.
Sp. Conductance	umhos/cm	2600.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.10
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	11.8
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	330.
Sodium	mg/l	98.8
Magnesium	mg/l	150.
Bicarbonate	mg/l	
Ammonia-Nitrogen	mg/l	0.400
Nitrogen-Nitrate	mg/l	(0.100
Nitrogen-Nitrite	mg/l	(0.002
Phenols	mg/l	
Chromium	mg/l	0.010
Cadmium	mg/l	
Lead	mg/l	0.058
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 105-D Down Gradient

Date Sampled: 05-06-82 07-14-82 10-26-82

Parameter	Units			
Static	Feet	603.87	604.00	603.50
COD	mg/l	2.00	41.0	110.
Iron	mg/l	2.80	3.40	4.30
Chloride	mg/l		160.	140.
Sulfate	mg/l	1400.	1300.	1100.
Sp. Conductance	umhos/cm	2300.	3084.	2216.
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
pH 1		7.02	7.06	6.10
pH 2				
pH 3				
pH 4				
TOC 1	mg/l	3.00	10.0	9.00
TOC 2	mg/l			
TOC 3	mg/l			
TOC 4	mg/l			
Calcium	mg/l	270.		
Sodium	mg/l			200.
Magnesium	mg/l	170.		
Bicarbonate	mg/l	220.		
Ammonia-Nitrogen	mg/l			0.410
Nitrogen-Nitrate	mg/l			0.010
Nitrogen-Nitrite	mg/l			0.010
Phenols	mg/l			
Chromium	mg/l	0.010		
Cadmium	mg/l			
Lead	mg/l			0.020
Napthalene	mg/l			

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Well: 105-D Down Gradient

Date Sampled: 08-24-83

Parameter	Units	
Static	Feet	603.87
COD	mg/l	39.0
Iron	mg/l	2.18
Chloride	mg/l	170.
Sulfate	mg/l	1510.
Sp. Conductance	umhos/cm	2800.
Sp. Conductance	umhos/cm	2800.
Sp. Conductance	umhos/cm	2800.
Sp. Conductance	umhos/cm	2800.
pH 1		7.60
pH 2		7.60
pH 3		7.60
pH 4		7.50
TOC 1	mg/l	11.0
TOC 2	mg/l	9.00
TOC 3	mg/l	5.00
TOC 4	mg/l	10.0
Calcium	mg/l	448.
Sodium	mg/l	128.
Magnesium	mg/l	240.
Bicarbonate	mg/l	260.
Ammonia-Nitrogen	mg/l	0.580
Nitrogen-Nitrate	mg/l	0.080
Nitrogen-Nitrite	mg/l	<0.020
Phenols	mg/l	
Chromium	mg/l	<0.020
Cadmium	mg/l	
Lead	mg/l	<0.050
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Well: 185-D Down Gradient

Date Sampled: 84-17-84

Parameter	Units	
Static	Feet	602.91
COD	mg/l	4.00
Iron	mg/l	2.00
Chloride	mg/l	150.
Sulfate	mg/l	3100.
Sp. Conductance	umhos/cm	2700.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		6.90
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	12.1
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	240.
Sodium	mg/l	100.
Magnesium	mg/l	150.
Bicarbonate	mg/l	210.
Ammonia-Nitrogen	mg/l	0.750
Nitrogen-Nitrate	mg/l	0.020
Nitrogen-Nitrite	mg/l	0.020
Phenols	mg/l	
Chromium	mg/l	0.020
Cadmium	mg/l	
Lead	mg/l	
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Sediment Pond

Date Sampled: 05-25-82 07-14-82 10-25-82

Parameter	Units			
Static	Feet			
COD	mg/l			
Iron	mg/l			
Chloride	mg/l			
Sulfate	mg/l			
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
Sp. Conductance	umhos/cm			
pH 1				
pH 2				
pH 3				
pH 4				
TOC 1	mg/l			
TOC 2	mg/l			
TOC 3	mg/l			
TOC 4	mg/l			
Calcium	mg/l			
Sodium	mg/l			
Magnesium	mg/l			
Bicarbonate	mg/l			
Ammonia-Nitrogen	mg/l			
Nitrogen-Nitrate	mg/l			
Nitrogen-Nitrite	mg/l			
Phenols	mg/l	<0.004	0.007	0.004
Chromium	mg/l	0.009	0.006	0.007
Cadmium	mg/l	<0.003	<0.003	0.003
Lead	mg/l	<0.010	0.010	0.010
Napthalene	mg/l	0.0005	0.005	0.005

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Sediment Pond

Date Sampled: 02-23-83 08-24-03

Parameter -----	Units -----		
Static	Feet		
COD	mg/l		
Iron	mg/l		
Chloride	mg/l		
Sulfate	mg/l		
Sp. Conductance	umhos/cm		
Sp. Conductance	umhos/cm		
Sp. Conductance	umhos/cm		
Sp. Conductance	umhos/cm		
pH 1			
pH 2			
pH 3			
pH 4			
TOC 1	mg/l		
TOC 2	mg/l		
TOC 3	mg/l		
TOC 4	mg/l		
Calcium	mg/l		
Sodium	mg/l		
Magnesium	mg/l		
Bicarbonate	mg/l		
Ammonia-Nitrogen	mg/l		
Nitrogen-Nitrate	mg/l		
Nitrogen-Nitrite	mg/l		
Phenols	mg/l	<0.010	<10.0
Chromium	mg/l	<0.020	<0.020
Cadmium	mg/l	<0.010	<0.010
Lead	mg/l	<0.050	<0.050
Napthalene	mg/l	<0.010	<0.005

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Sediment Pond

Date Sampled: 04-17-84

Parameter	Units	
Static	Feet	
COD	mg/l	
Iron	mg/l	
Chloride	mg/l	
Sulfate	mg/l	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		
pH 2		
pH 3		
pH 4		
TOC 1	mg/l	
TOC 2	mg/l	
TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	
Sodium	mg/l	
Magnesium	mg/l	
Bicarbonate	mg/l	
Ammonia-Nitrogen	mg/l	
Nitrogen-Nitrate	mg/l	
Nitrogen-Nitrite	mg/l	
Phenols	mg/l	<0.002
Chromium	mg/l	<0.020
Cadmium	mg/l	0.010
Lead	mg/l	<0.050
Napthalene	mg/l	<0.001

Allen Park Clay Mine

Ground Water Monitoring Data

Additional Water Quality Parameters

Allen Drain

Date Sampled: 04-26-83 08-24-83

Parameter	Units		
Static	Feet		
COD	mg/l	35.0	4.00
Iron	mg/l	0.560	1.00
Chloride	mg/l	210.	120.
Sulfate	mg/l	550.	450.
Sp. Conductance	umhos/cm	1800.	
Sp. Conductance	umhos/cm	1800.	
Sp. Conductance	umhos/cm	1800.	
Sp. Conductance	umhos/cm	1800.	
pH 1		7.20	
pH 2		7.20	
pH 3		7.20	
pH 4		7.20	
TOC 1	mg/l	33.0	15.0
TOC 2	mg/l		15.0
TOC 3	mg/l		15.0
TOC 4	mg/l		15.0
Calcium	mg/l		150.
Sodium	mg/l		80.0
Magnesium	mg/l		37.0
Bicarbonate	mg/l		120.
Ammonia-Nitrogen	mg/l		0.330
Nitrogen-Nitrate	mg/l		0.020
Nitrogen-Nitrite	mg/l		<0.020
Phenols	mg/l		
Chromium	mg/l		<0.020
Cadmium	mg/l		
Lead	mg/l		<0.050
Napthalene	mg/l		

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Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Tyre Drain

Date Sampled: 04-26-83 08-24-83

Parameter -----	Units -----	
Static	Feet	
COD	mg/l	80.0
Iron	mg/l	0.650
Chloride	mg/l	590.
Sulfate	mg/l	210.
Sp. Conductance	umhos/cm	1518.
Sp. Conductance	umhos/cm	1518.
Sp. Conductance	umhos/cm	1518.
Sp. Conductance	umhos/cm	1518.
pH 1		6.90
pH 2		6.90
pH 3		6.90
pH 4		6.90
TOC 1	mg/l	24.0
TOC 2	mg/l	
• TOC 3	mg/l	
TOC 4	mg/l	
Calcium	mg/l	
Sodium	mg/l	
Magnesium	mg/l	
Bicarbonate	mg/l	
Ammonia-Nitrogen	mg/l	
Nitrogen-Nitrate	mg/l	
Nitrogen-Nitrite	mg/l	
Phenols	mg/l	
Chromium	mg/l	
Cadmium	mg/l	
Lead	mg/l	
Napthalene	mg/l	

Allen Park Clay Mine
Ground Water Monitoring Data
Additional Water Quality Parameters
Allen Drain

Date Sampled: 04-17-84

Parameter	Units	
Static	Feet	
COD	mg/l	16.0
Iron	mg/l	0.460
Chloride	mg/l	180.
Sulfate	mg/l	730.
Sp. Conductance	umhos/cm	1700.
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
Sp. Conductance	umhos/cm	
pH 1		7.20
pH 2		
pH 3		
pH 4		
TDC 1	mg/l	20.0
TDC 2	mg/l	
TDC 3	mg/l	
TDC 4	mg/l	
Calcium	mg/l	110.
Sodium	mg/l	120.
Magnesium	mg/l	35.0
Bicarbonate	mg/l	160.
Ammonia-Nitrogen	mg/l	0.750
Nitrogen-Nitrate	mg/l	0.460
Nitrogen-Nitrite	mg/l	0.050
Phenols	mg/l	
Chromium	mg/l	0.630
Cadmium	mg/l	
Lead	mg/l	
Naphthalene	mg/l	

Ford Allen Park Clay Mine

MID 980568711

Section F Procedures to Prevent Hazards

F-1 Security Procedures 40 CFR 270.14(b)(4)

We believe that physical contact with the wastes, structures or equipment within the active portion of the facility is not likely to injure unknowing or unauthorized persons or livestock. However, security measures have been taken in satisfaction of 264.14(b)(2) and (c) as stated in the Site Security Plan (Attachment 17).

FORD MOTOR COMPANY ALLEN PARK CLAY MINEMID 980568711SITE SECURITY PLAN

1. All entry to the facility is through one main gate located off Oakwood Boulevard, between Interstate 94 and Southfield Freeway. During hours of operation, all vehicles and visitors must pass by an attended check-in trailer for entry.
2. The operational hours for the hazardous waste site is 7:00 a.m. to 3:00 p.m., Monday through Friday. The solid waste site is open 16 hours per day, Monday through Friday.
3. A six foot cyclone fence topped with three strand barbed wire has been constructed around the entire perimeter of the site. Surface water drains and large screening berms on the site perimeter further impede unknowing or unauthorized entry by persons or animals.
4. Warning signs that read "No Trespassing - Violators will be Prosecuted" are affixed to the perimeter fence at intermittent spacing which will discourage unauthorized entry.
5. Physical contact with the wastes, structures, or equipment with the active portion of the facility will not injure unknowing or unauthorized persons or livestock which may enter the active portion of the facility.
6. Warning signs that read "Danger Unauthorized Personnel Keep Out" are posted at each entrance to the active portion of the facility in

sufficient numbers to be seen from any approach to the active area.

7. Entrance gate is locked by manifest checker when facility is closed.
8. Ford Motor Company Rouge Plant Security provides additional security coverage on an inspection audit basis.

F-2

General Inspection Requirements 40 CFR 270.14(b)(5)

F-2b

Landfill Inspection 40 CFR 264.303(b)

The general inspection schedule and the inspection procedures for the facility are provided in Attachment 18. The backside of the inspection schedule is used for detailed notations and explanations or observations. The inspector initials the items which were checked and provides the date and time of inspections.

F-3

Equipment Requirements 40 CFR 270.14(b)(6)

The hazardous wastes handled at the facility are not considered to be "acutely toxic". Accordingly, an internal communications or alarm system is not necessary. A telephone is available for external communications at the manifest office trailer for summoning general emergency assistance. The hazardous waste management area is in view from the manifest office trailer. Fire extinguishers are available for the manifest office trailer and mobile equipment. Water is available on site in ditches and the pond as well as a fire hydrant. The wastes disposed of are not flammable. Due to the facility layout, aisle space requirements have been met.

Hazardous Waste

General Inspection Procedures

Ford Motor Company - Allen Park Clay Mine Landfill

A. Surveillance Schedules and Procedures

During hours of operation, surveillance is the responsibility of the supervising inspector, check-in trailer staff as well as operators at the active fill area. In addition, the landfill is periodically patrolled by Ford security personnel. During hours when the site is closed, the only entry gate is locked preventing unauthorized entry. Refer to Site Security Plan.

B. Routine Maintenance Procedures and Schedules

To minimize the possibility of unplanned sudden or non-sudden releases of hazardous wastes or hazardous waste constituents to air, soil or water, routine facility inspections are conducted and maintenance performed as required. The following checklist is utilized:

Daily Items - Monday Through Friday and After Storms

1. Proper Disposal - Insure that proper wastes are unloaded and landfilled in the appropriate location.
2. Gate Security - Insure the proper functioning of the gate and lock.
3. Access Road - Inspect the road for repairs, proper cleaning or dust suppression.
4. Warning Signs - Insure that appropriate warning signs are visible.
5. Daily Cover - Insure that cover material is available and that incoming wastes are covered daily.

- 2 -

6. Storm Water - Insure that storm water collected in the inactive areas does not come in contact with active work areas. Inspect integrity of diversion berms in the cell in order to maintain separation of active from inactive work areas. Inspect run-on and run-off diversion berms and dikes for erosion or general damage that would allow water into the waste management area.
7. Leachate System - Inspect the sampling manhole for proper flow recording and leachate sampling. Verify that system is in operating order and that monitor equipment is functioning. Inspect leachate discharge lines for damage or leaks especially the integrity of the clean out pipes. Check for vandalism of the electrical control boxes and the locks on the manhole covers.

Weekly Items

1. Fire Extinguishers - Check the availability and pressure gauges on the fire extinguishers. Extinguishers are in Manifest Trailer and mobile operating equipment.
2. Gauze Masks - Verify that the gauze masks are available.
3. Perimeter Fence - Look for locations where the fence is in disrepair.
4. Surface Drains - Look for blocked drainage or surface water contamination.
5. Sediment Basin - Check the outflow for blocked drainage and surface water contamination.
6. Intermediate cover - Inspect all fill areas that do not have final cover to insure that intermediate cover is adequate. Inspect for erosion or other damage that could or has exposed wastes.

- 3 -

Quarterly Items

1. Monitor Wells - Inspect integrity of protective casings, including caps and locks.
2. Final cover - Inspect all areas which have received final cover for deep rooted vegetation, deterioration of vegetative cover, areas of surface erosion and other surface disturbances.

HAZARDOUS WASTE
GENERAL INSPECTION SCHEDULE AND CHECKLIST
FORD MOTOR COMPANY - ALLEN PARK CLAY MINE LANDFILL MID980568711

	Date	Time	Note	Inspector	Note	Inspector	Note	Inspector	Note	Inspector	Note	Inspector	Note	Inspector
<u>Daily Items</u>														
Proper Disposal														
Gate Security														
Access Road														
Warning Signs														
Daily Cover														
Storm Water														
Leachate System														
<u>Monthly Items</u>														
Fire Extinguishers														
Gauze Masks														
Perimeter Fence														
Surface Drains														
Sediment Basin														
<u>Quarterly Items</u>														
Monitor Wells														
Final Cover														

- () Refer to backside for notations and corrections to previous problem areas.
() Refer to Spill and Accident Prevention Plan for Procedures.

-over-

F-4 Preventive Procedures, Structures, and Equipment 40 CFR 270.14(b)(8)

F-4a Unloading Operations 40 CFR 270.14(8)(i)

The unloading operation consists of tipping the truck box which requires level ground. The bulldozer operator is responsible for providing a level dump area within the waste management unit.

F-4bc Run-Off/Water Supplies 40 CFR 270.14(b)(8)(ii)(iii)

The topography of the area as shown on the Engineering Drawings (Attachment 14) prevents run-off by collecting any storm waters in the cell excavations as run-on. Contaminated water is not discharged to surface drains but is treated. The area is served by city water provided by Detroit Water and Sewerage Department.

F-4d Equipment and Power Failures 40 CFR 270.14(b)(8)(iv)

The sump pumps installed in Cell I are available to replace the pumps in Cell II in times of mechanical failure. Heavy equipment and portable generators are also available at the Rouge Complex in case of a mechanical or power failure.

F-4e Personnel Protection Equipment 40 CFR 270.14(b)(8)(v)

Operators are not required to wear protective clothing except for safety shoes, due to the relatively innocuous nature of the waste involved. Gauze masks are provided to operators for handling K061 if they do not operate in an enclosed cab.

F-5 Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Wastes 40 CFR 270.14(b)(9)

Ignitable, flammable, reactive, or incompatible wastes are not handled at the facility.

Ford Allen Park Clay Mine

MID 980568711

Section G Contingency Plan

The contingency plan will be reviewed and immediately amended, as necessary, whenever:

- . The facility R.C.R.A. permit is revised.
- . The plan fails in an emergency.
- . The facility changes in its design, construction, operation, maintenance, or other circumstances in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes in the response necessary in any emergency.
- . The list of emergency coordinators change.
- . The list of emergency equipment changes.

Section G Contingency Plan 40 CFR 270.14(b)(7)

G-1 General Information

The hazardous waste disposal facility consists of 16.5 acres in the northeast corner of the site as shown on the site plan. The site address is 17250 Oakwood Boulevard, Allen Park, Michigan 48101, and the site mailing address is Ford Motor Company, 3001 Miller Road, Room 2042, Rouge Office Building, Dearborn, Michigan 48121. The facility is owned and operated by Ford Motor Company, and Mr. Ben C. Trethewey is the current Manager. He may be reached at (313) 594-2242 from 8:00 a.m. to 4:30 p.m. on weekdays.

Waste types to be disposed of at the facility are:

- . (K061) Electric Furnace Emission Control Dust
- . (K087) Decanter Tank Tar Sludge from Coking Operations
- . (F006) Wastewater Treatment Sludge from Electroplating Operations
- . (D006) EP Toxic - Cadmium
- . (D007) EP Toxic - Chromium
- . (D008) EP Toxic - Lead

G-2 Emergency Coordinators (In Priority Order) 40 CFR 264.52(d)

1. Ben C. Trethewey, Primary Emergency Coordinator

Office: (313) 594-2242

Home: (313) 278-0995

3001 Miller Road

6125 Fairwood

Room 2042, R.O.B.

Dearborn Heights, MI 48127

Dearborn, MI 48121

2. David S. Miller

Office: (313) 322-0700 Home: (313) 662-4435
3001 Miller Road 3601 Elizabeth
Room 2045, R.O.B. Ann Arbor, MI 48104
Dearborn, MI 48121

3. Douglas A. Painter

Office: (313) 322-0702 Home: (313) 278-8282
3001 Miller Road 22509 Gregory
Room 2045, R.O.B. Dearborn, MI 48124
Dearborn, MI 48121

4. Edward Kebblish

Office: (313) 322-0701 Home: (313) 349-4173
3001 Miller Road 42164 Brampton Ct.
Room 2045, R.O.B. Northville, MI 48167
Dearborn, MI 48121

G-3 Implementation 40 CFR 264.52(d)
 40 CFR 264.55

The contingency plan will be implemented by the emergency coordinator when an imminent or actual hazard incident could threaten human health and/or the environment. Example of such hazards could be fire, fumes, dike failure, or storm water overflow.

G-4a Emergency Contacts and Notification Procedures 40 CFR 264.56(a)

Any unplanned release of hazardous waste to the soil, air or surface water at the facility which could threaten human health or the environment would warrant implementation of this plan, as well as any condition which if not corrected might cause such a release. The above

emergency coordinator(s) should be contacted if the plan must be implemented, and additional emergency numbers for locally available help are provided as follows:

	<u>Area Code (313)</u>
1. Ford Plant Security.....	322-3211
2. Allen Park Fire Department.....	928-4100
3. Allen Park Police Department.....	386-7800
4. Wayne County Sheriff.....	224-2222
5. Michigan State Police.....	256-9636
6. E.M.S. (Taylor).....	295-3300
7. Pollution Emergency Alerting System (D.N.R.).....	1-800-292-4706

HOSPITAL EMERGENCY NUMBERS

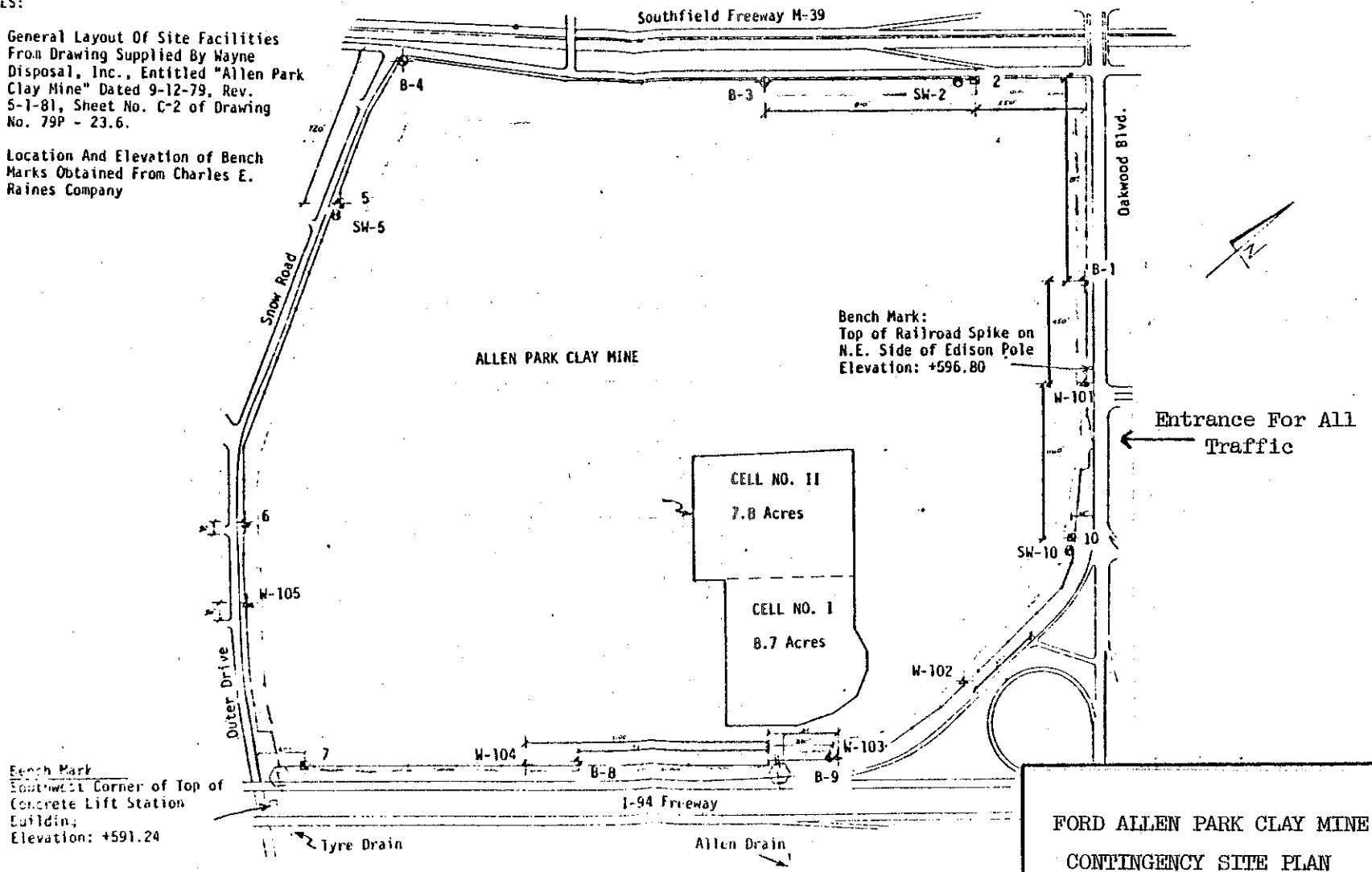
1. Oakwood Hospital.....	336-3000
2. Outer Drive Hospital.....	386-2000
3. University of Michigan Hospital - Ann Arbor..... (Poison Information)	1-764-5120

The person reporting the situation to the emergency coordinator should give the following information:

1. All circumstances known to exist which may effect emergency actions to be taken.
2. Name of person reporting conditions.
3. Location of problem area within the facility.
4. Time of the incident occurring, if known.
5. Type of materials involved, if known.
6. Any injuries to personnel or damage to equipment if such has occurred.
7. All actions taken, so far, to prevent further harm to human health or the environment.
8. How incident occurred, if known.
9. Request time of arrival for Emergency Coordinator at incident site and any further instructions for actions in the interim.

NOTES:

1. General Layout Of Site Facilities From Drawing Supplied By Wayne Disposal, Inc., Entitled "Allen Park Clay Mine" Dated 9-12-79, Rev. 5-1-81, Sheet No. C-2 of Drawing No. 79P - 23.6.
2. Location And Elevation of Bench Marks Obtained From Charles E. Raines Company



G-4b Identification of Hazardous Materials 40 CFR 264.56(b)

The emergency coordinator will immediately identify the character, source, extent of the release. The initial identification method will be to utilize visual analysis of the material and location of the release. Any wastes known or suspected to be involved in a release must be sampled (bottles available in manifest trailer).

G-4c-h

Upon receiving a call from facility personnel that an emergency condition exists, the emergency coordinator shall evaluate steps to be taken from the information reported and give instructions as required. The coordinator should then immediately proceed to the site, to conduct the following:

1. Assess extent of emergency.
2. Contact appropriate emergency support agencies if needed.
3. Take precautions to prevent spreading of a spill or fire to other areas.
4. Remove non-employees, and non-essential employees from incident area, particularly during operating hours.
5. Assemble all personnel at trailer for instructions and personnel count.
Direct personnel in responding to the incident, if appropriate, or wait for outside emergency personnel and assist in their containment efforts.
6. Prevent additional traffic from entering incident area.
7. Clear road(s) for emergency vehicles and equipment.
8. Contact "hazardous waste checker" if on duty, or check waste inventory log for information on wastes in the incident area to determine potential hazards such as toxic, irritating or asphyxiating gases generated as a result of fire or explosion.
9. In event of fire, consider smoke visibility hazard on I-94 or Southfield Freeways and advise State Police personnel for action.

10. If an evacuation of personnel is appropriate, contact the National Response Center (800-424-8802) and report the following:
 - A. Name and phone number of reporter
 - B. Name and address of facility
 - C. Time and type of incident
 - D. Name and quantity of material involved, to the extent known
 - E. The extent of injuries if any
 - F. Possible hazards to human health, or the environment, outside the facility
11. Immediately after an incident, make assessment to determine the need for disposing of recovered waste, contaminated soil or surface waters or any other material that results from release, fire, or explosion at the facility. (Assume materials are hazardous)
12. The emergency coordinator must ensure that, in the affected area(s) of the facility:
 - a. No waste that may be incompatible with the released materials is treated, stored, or disposed of until cleanup procedures are completed.
 - b. All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.
13. The owner and operator must notify the Regional Administrator, and appropriate State and local authorities, that the facility is in compliance with applicable requirements before operations are resumed in the affected area(s) of the facility.

4c through 4m not applicable.

G-4n

Landfill Leakage 40 CFR 264.52

The facility does not have a leak detection system because it has been demonstrated that liquid will not migrate into the liner during the life of the facility under the provisions of 40 CFR 264.90(b)(4).

G-5

Emergency Equipment and Power Sources 40 CFR 264.52(e)

Fire Extinguishers

- 1 for gas, oils, solvents, located at office trailer.
- 1 for liquids, electrical, combustibles, located at office trailer.
- 1 for liquids, electrical, combustibles, located at bulldozer.

Water Wagon

- 2,500 gallon truck with high pressure spray nozzle, available on-site, weather permitting (March - October).

Caterpillar D-7

- Wide-track bulldozer for spill containment, etc.

Misc. Mobil Equipment

- Available at the Ford Rouge Plant upon request (front endloaders, vacuum truck, etc.).

Telephone

- Located at office trailer.

Fire Hydrant

- Located north of entrance gate.

As required under 40 CFR 264.37, the notice in Attachment 19 has been sent to the local authorities. Subsequent modifications will be forwarded as changes occur.

The local authorities have declined to enter into contingency plan arrangements, as indicated by the correspondence in Attachment 19, and is documented in accordance with 264.37(b). Ford Motor Company Rouge Plant Security is available for any emergency help as may be needed.

G-7 Evacuation Procedures 40 CFR 264.52(f)

The facility is an open field whereby specific evacuation routes and emergency aisle space are not required. Personnel are instructed to proceed to the manifest trailer if it is necessary to abandon their work station.

G-8 Required Reports 40 CFR 264.56(j)

The owner or operator must note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within 15 days after the incident, he must submit a written report on the incident to the U. S. EPA Regional Administrator. The report must include:

- a. Name, address, and telephone number of the owner and operator.
- b. Name, address, and telephone number of the facility.
- c. Date, time, and type of incident (e.g. fire, explosion).
- d. Name and quantity of material(s) involved.
- e. The extent of injuries, if any.
- f. An assessment of actual or potential hazards to human health or the environment, where this is applicable.
- g. Estimated quantity and disposition of recovered material that resulted from the incident.



Wayne Disposal Inc.

P. O. Box 5187
Dearborn, Michigan 48128
(313) 326-0200

November 11, 1981

Allen Park Police Department
16850 Southfield Road
Allen Park, Michigan 48101

RE: Allen Park Clay Mine, 17250 Oakwood Boulevard, Allen Park, Mi. 481

Dear Gentlemen/Ms.

In response to Federal requirements under the Resource Conservation and Recovery Act of 1976, all storers, treaters and disposers of hazardous waste must prepare a "Contingency Plan" and emergency procedures for implementation under situations that endanger human health and the environment such as fires, explosions or releases (sudden or non-sudden) of waste into the environment.

It is a requirement that the hazardous waste facility provide copies of the plan to appropriate emergency support agencies and facilities. The hazardous wastes disposed of at the Allen Park Clay Mine are generated at the Ford Rouge Manufacturing Complex, in particular in steelmaking and coking operations. These wastes are not flammable, ignitable, reactive nor corrosive. They pose virtually no threat to human health upon exposure.

Due to the small quantities and nature of these wastes, we believe the possibility of an emergency occurrence to be extremely remote; however, as the law requires we are supplying you with a copy of our plan. If any questions should arise, do not hesitate to call Walt Tomyn or me at 326-0200.

Very truly yours,
Wayne Disposal, Inc.

Mark A. Young
Mark A. Young, P.E.

MAY/kdb

c.c. Allen Park Fire Department
Wayne County Sheriff
Michigan State Police
Lynn Hospital
Outer Drive Hospital'



William Lucas, Wayne County Sheriff, Detroit, Michigan 48226
Loren M. Pletman, Under Sheriff and Chief Deputy

Executive and Jail Division, 224-2222 Court Division, 224-2260 Patrol & Investigation, 561-5880 Metropolitan Airport, WH 1-1200

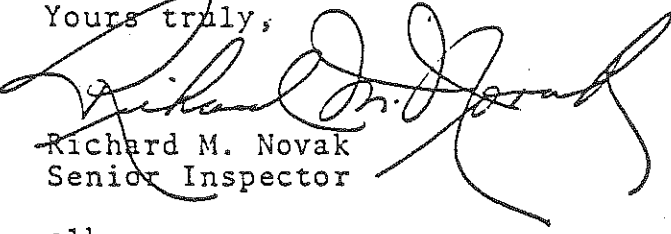
November 19, 1981

Mark A. Young, P.E.
Wayne Disposal, Inc.
P.O. Box 5187
Dearborn, Michigan 48128

Dear Mr. Young:

The purpose of this communication is to confirm our telephone conversation of November 18, 1981. Our Department is not capable to handle evacuation activities at this time due to a severe manpower shortage.

Yours truly,


Richard M. Novak
Senior Inspector

slh

Address Reply to: William Lucas, Sheriff



OUTER DRIVE HOSPITAL UNIT OF PEOPLES COMMUNITY HOSPITAL AUTHORITY

H. ARTHUR SUGARMAN, ADMINISTRATOR. 26400 OUTER DRIVE, LINCOLN PARK, MICHIGAN 48146 (313) 385-2000

MEMBER COMMUNITIES

CITIES OF

ALLEN PARK

BELLEVILLE

DEARBORN HEIGHTS

ECORSE

FLAT ROCK

GARDEN CITY

INKSTER

LINCOLN PARK

MELVINDALE

RIVER ROUGE

ROCKWOOD

ROMULUS

SOUTHGATE

TAYLOR

TRENTON

WAYNE

WESTLAND

WOODHAVEN

YPSILANTI

TOWNSHIPS OF

HURON

SUMPTER

SUPERIOR

VAN BUREN

YPSILANTI

November 23, 1981

Mr. Mark A. Young, P.E.
Wayne Disposal, Inc.
P.O. box 5187
Dearborn, MI 48128

RE: Allen Park Clay Mine


Dear Mr. Young:

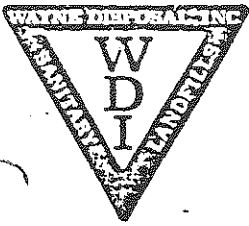
In regards to your conversation with Mr. Greg Wheeler, Assistant Plant Engineer on November 23, 1981, we are requesting a chemical analysis breakdown of the hazardous material that is disposed of at the Allen Park Clay Mine.

This is to insure that should an accident occur that we at Outer Drive Hospital would have on file a statement as to the contents of the hazardous material for the protection of a possible emergency room case.

Thanking you in advance.

Sincerely,


Mr. Greg Wheeler,
Assistant Plant Engineer



Wayne Disposal Inc.

P. O. Box 5187
Dearborn, Michigan 48128
(313) 326-0200

November 24, 1981

Mr. Jack Quillen, Plant Engineer
Outer Drive Hospital
26400 W. Outer Drive
Lincoln Park, Michigan 48146

Dear Mr. Quillen:

Per your request, here are chemical analyses of the two hazardous wastes landfilled at the Allen Park Clay Mine. We hope this information will be satisfactory. Should questions arise, give me a call.

Very truly yours,
Wayne Disposal, Inc.

Mark A. Young
Mark A. Young, P.E.

MAY/kdb
Enclosures

Electric Furnace Flue Dust (K061)

A. Sample Taken:
Lab No. 004680

1. E.P. Toxicity per U.S. EPA SW-846, 1980

<u>Element</u>	<u>Results, ppm</u>	<u>Method of Analysis</u>
Arsenic	0.6	EPA 600/4-79-020
Barium	< 0.8	"
Cadmium	45.0	"
Chromium	1.6	"
Lead	340	"
Mercury	0.0015	Perkin-Elmer 303-3119
Selenium	2.0	I.C.P.
Silver	0.8	EPA 600/4-79-020

2. Chemical Analysis of Electric Furnace Flue Dust

<u>Element</u>	<u>Results (mg/kg)</u>	<u>Method of Analysis</u>
Arsenic	50	ASTM E 663
Barium	< 0.8	"
Cadmium	95.0	"
Chromium	500	"
Lead	4,500	"
Mercury	< 0.3	I.C.P.
Selenium	2.0	I.C.P.
Silver	6.0	ASTM E 663
Manganese	39,000	"
Zinc	150,000	"
Phosphorus	450	Molybdate
Sulfur	3,600	lr 32-Ieco
Calcium	61,000	ASTM E 663
Magnesium	11,000	"
Aluminum	2,400	"
Silicon	15,000	Na ₂ CO ₃ Fusion
Potassium	5,900	ASTM E 663
Sodium	5,200	"
Fluorine	26.2	Ion Chromatograph
Total Iron	350,000	ASTM E 663
Dissolved Iron	800	"
Cyanide	0.1	EPA 79, M3352
Phenol	0.960	EPA 79, M420.1
Carbon	4,700	Ieco Wr-12

Coke Oven Tar Decanter Sludge (K087)

A. Sample Taken: 8-28-80
Lab No. 005092

1. E.P. Toxicity per U.S. EPA SW-846, 1980

<u>Element</u>	<u>Results, ppm</u>	<u>Method of Analysis</u>
Arsenic	< 0.1	EPA 600/4-79-020
Barium	< 0.8	"
Cadmium	< 0.005	"
Chromium	< 0.1	"
Lead	0.2	"
Mercury	0.0001	Perkin-Elmer 303-3119
Selenium	< 0.25	EPA 600/4-79-020
Silver	< 0.1	"

2. Ignitability per U.S. EPA SW-846, 1980, Section 4.0

Flash Point > 60°C
ASTM D 93

3. Reactivity per U.S. EPA SW-846, 1980, Section 6.0

Total Cyanide 10.65 ppm
EPA 79, M3352

Ford Allen Park Clay Mine

MID 980568711

Section H Personnel Training

H-1 Outline of the Training Program 40 CFR 264.16(a)(1)

Facility personnel are provided with introductory and continuing training (annual basis) that is site specific and relevant to the particular job responsibilities of the individual employees. Facility personnel are provided by Ford Motor Company as well as independent waste management concerns, which provide their own training programs. This training is utilized to the extent of its relevance.

Job Descriptions
H-1a Job Titles/Job Descriptions 40 CFR 264.14(d)(1)

Hazardous Waste Shipment and Manifest Checker - Requisite qualifications are good judgement, common sense and good communication skills.

1. Inspection of hazardous waste shipments.
 - a. Identify hazardous wastes visually by comparison with on-site sample (visual and/or smell).
 - b. Verify volume of shipment visually with no more than 10% error (volume basis).
2. Direct transporter to dump hazardous wastes in designated area.
3. Sign valid manifests and retain necessary copies.
4. Record shipment information with disposal location cross-reference.
5. Deliver transporter to dump hazardous wastes in designated area.
6. When manifest discrepancies occur:
 - a. Contact generator for explanation.
 - b. Refuse permission to dispose of shipment if explanation in a. is not sufficient.
7. Keep disposal map locator up to date.
8. Make required inspections under the general inspection procedure.
9. Review aspects of facility inspections.
10. Activate when conditions warrant the Spill and Accident Prevention Plan, Contingency Plan and Emergency Procedures.

Operating Engineer - Requisite qualifications are good judgement, common sense, experience on heavy machinery operation and maintenance.

1. Maintain equipment (Tracked Dozer) in good working order.
2. Notify management of equipment problems.
3. Keep fill site graded and covered with inert material as conditions warrant.
4. Maintain area in neat and orderly appearance.
5. Assist manifest checker in observations required by the general inspection procedure.
6. Verify identity and volume of waste before burial.
7. Implement safety procedures.
8. Implement procedures for using, inspecting, repairing and replacing emergency and safety equipment.

Foreman - Requisite qualifications are good judgement and common sense, experience on heavy machinery operation and maintenance.

1. Responsible for day-to-day supervision of construction and maintenance personnel.
2. Make required site inspections.
3. Knowledge of the Spill and Accident Prevention Plan, Contingency Plan and Emergency Procedures.
4. Knowledge and implementation of safety procedures.
5. Functions as emergency coordinator in absence of Ford Motor Company officials.

Inspectors Responsibility - Requires good judgement, common sense and good communication skills.

1. Perform inspections as needed, in addition to a daily and weekly schedule.
2. Maintain the leachate sampling device. Maintain the leachate collection system.
3. Report to Ford representatives the status of facility operations.
4. Provide coordination for facility activities.
5. Knowledge of the Spill and Accident Prevention Plan, Contingency Plan and Emergency Procedures.

Ford Training Program

Employees will be assembled every 12 months to review pertinent aspects of their job.

Hazardous Waste Shipment and Manifest Checker - Receives introductory on-the-job training.

1. Physical properties and characteristics of the wastes are discussed in detail.
2. Inspection and waste verification procedures are practiced in order to verify waste identity and volume.
3. Processing the manifest form is discussed including manifest discrepancies.
4. Recordkeeping procedures are discussed.
5. General inspection procedures are discussed.
6. Pertinent waste handling and disposal regulations are discussed.
7. The Spill and Accident Prevention Plan, Contingency Plan and Emergency Procedures are discussed.
8. Safety procedures are discussed.

Operating Engineer - Receives introductory on-the-job training.

1. Physical properties and characteristics of the wastes are discussed in detail.
2. Inspection and waste verification procedures are discussed in order to verify waste identity.
3. General inspection items and procedures are discussed.
4. Pertinent waste handling and disposal regulations are discussed.
5. The Spill and Accident Prevention Plan, Contingency Plan and Emergency Procedures are discussed.
6. Fill and grading plan are discussed.
7. Safety procedures and procedures for using, inspecting, repairing and replacing emergency safety and monitoring equipment are discussed.

Foreman - Receives introductory on-the-job training.

1. Physical properties and characteristics of the wastes are discussed in detail.
2. Processing the manifest form is discussed including manifest discrepancies.
3. General inspection procedures are discussed and practiced.
4. Pertinent waste handling and disposal regulations are discussed.
5. The Spill Plan and Accident Prevention Plan, Contingency Plan and Emergency Procedures are discussed.
6. Safety procedures and procedures for using inspecting, repairing and replacing emergency, safety and monitoring are discussed.
7. Fill and grade plans are discussed.

Inspectors Responsibility - Requires good judgement, common sense and good communication skills.

1. Perform inspections as needed, in addition to a daily and weekly schedule.
2. Maintain the leachate sampling device. Maintain the leachate collection system.
3. Report to Ford representatives the status of facility operations.
4. Provide coordination for facility activities.
5. Knowledge of the Spill and Accident Prevention Plan, Contingency Plan and Emergency Procedures.

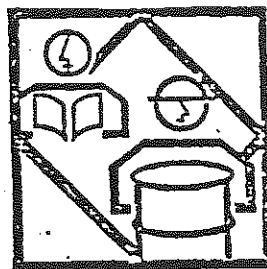
Michigan Hazardous Waste Industry
Training and Technical Assistance Program

An example of the training provided by the independent waste management concerns is provided as Attachment 20.

A recorded schedule of trained employees is provided as Attachment 21.

HAZARDOUS WASTE HANDLER'S TRAINING COURSES

Michigan Hazardous Waste Industry Training and Technical Assistance Program



Michigan State University, Community Development Programs
27 Kellogg Center
East Lansing, MI 48824

In cooperation with the Liquid Industrial Control Association

Supported by a grant from the Michigan Department of Labor
Safety Education and Training Program



Michigan Hazardous
Waste Industry
Training and Technical
Assistance Program

Community
Development
Programs
Michigan State University
27 Kellogg Center
East Lansing, MI 48824
(517) 355-0100

199 Pierce Street
Birmingham, MI 48011
(313) 642-9797

April 13, 1983

To: Members, Act 64 Advisory Committee

From: Lynn A. Corson, Ph.D. *LAC*

Subject: Conveyance of Material Re: Michigan Hazardous Waste
Industry Training and Technical Assistance Program

It is with pleasure that I respond to the request of one of your members, Mr. Walter Pociask, K & D Industrial Services, and provide the attached information.

The Curriculum Guide provides a general outline of the various courses offered to employees of firms licensed as processors or haulers of hazardous waste under Act 64 and transporters of liquid industrial waste licensed under Act 136.

The brochure describes the training and technical assistance program in more detail.

I will be pleased to answer any questions that the Committee or its individual members may have regarding the program.

005 Overview: Safety Hazards of Working with Hazardous Wastes
Instructional Outline

Topics

1. Physical Properties of Chemicals
 - a. Physical states: solid, liquid, gas, vapor.
 - b. Organics and inorganics - solvents, etc.
 - c. Acids and bases - pH
2. Incompatible chemicals - problems with mixing
 - a. Release of noxious gases: e.g., cyanide, H_2S
 - b. Release of heat - concentrated acids and bases
 - c. Other examples - MDOL/SET list
3. Storage and labeling - applies to all containers - large or small
 - a. Proper identification of contents - keep in original container whenever possible
 - b. Store in proper area: e.g., flammables, incompatibles, corrosives
 - c. Other considerations - don't stack too high to present handling difficulty; leakage problems; aisles between; containment provisions
4. Materials handling -
 - a. Housekeeping
 - b. Proper lifting techniques
 - c. Drum handling
 - d. Lift trucks
 - e. MDOL/SET "5 minute safety talks"
5. Controls - Engineering controls and Personal Protective Equipment
 - a. Hazards Recognition
 - 1) Falling
 - 2) Striking
 - 3) Being caught
 - 4) Contact injuries
 - 5) Breathing in harmful atmospheres
 - b. Other - machine guarding, blind corners, barricade, construction.
6. Fire Safety
 - a. Prevention - housekeeping; call list; disaster plan
 - b. Theory - fire triangle; flash point; L.E.L.; U.E.L.; extinguishment principles
 - c. Equipment - blanket; extinguisher use - CO , CO_2 , dry chemical
7. Confined Space Entry - Definition
 - a. Legal - MIOSHA rules
 - b. Hazards awareness - CO , CO_2 , toxic gases, flammables
 - c. Atmosphere testing - $\%O_2$ and L.E.L.; meters; toxic gas sampling; ventilation area
 - d. Victim rescue and equipment for safe entry
8. First Aid - Immediate action -
 - a. Prevention and Readiness - first aid rules and kits
 - b. Procedures - immediate flushing, call list
 - c. Equipment - drenching showers, eye washes
 - d. Chronic - dermatitis prevention

Resources

1. Handout - Employee Safe Work Manual - Dray Publishing Co.
2. Chart - Flammable liquid chart

Physical States of Matter

Matter can exist in three different states, designated as solid, liquid, and gas (Fig. 1-1), which can be distinguished by certain qualities.

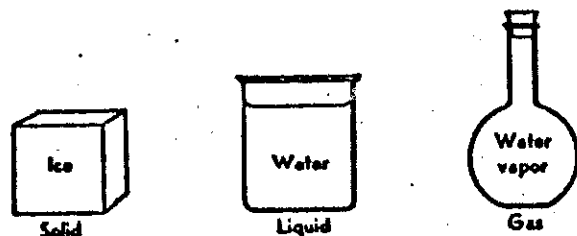


Fig. 1-1 The physical states of matter as illustrated by water.

A good example of these three states of matter is furnished by a block of ice. As ice it is a solid, the shape of which can be changed by moderate force, but its volume can be changed only by a very great force; i.e., ice is only very slightly compressible. If its temperature is raised it melts, that is, it passes into the liquid state as water. Its shape then will depend on the vessel it is in, or if spilled on the ground it will flow into whatever cavities and spaces there are between the particles that make up the soil. As water, its volume can be changed very little because, like ice, it is nearly incompressible. Heated to boiling in an open vessel, it changes to a gas or vapor and will expand and disappear completely in the air. Heated in a closed vessel, the vapor is retained in the form of steam, causing pressure on the sides of the vessel.

This expansion due to the change from the liquid to the gaseous state by heating is extremely important. Without it there would be no steam engines or steam power plants. This has its bad side too, for it causes boiler explosions and furnishes most of the explosive force of volcanoes.

Few substances can change as readily under normal conditions into the three states of matter as water. But the safety man should recognize that change in the state of matter, as from solid to liquid to gaseous, occurs in many chemical processes. The degree of expansion when changing from one state to another (liquid to gas) has marked safety implications.

Vapor

The term vapor is applied to the gaseous form of substances that at ordinary temperature can exist both as a gas and as either a liquid or a solid. For example, gasoline, normally a liquid, vaporizes to produce a gas which when mixed with the correct amount of air makes our automobiles run. Water at all ordinary temperatures evaporates to form a gas which we ordinarily refer to as water vapor. Vapors are often a nuisance, a byproduct of the use of the liquid or solid producing them. They are also used to do work, such as vapor degreasing. Many vapors are toxic, for example, the vapor of carbon tetrachloride; and the safety man should be on guard whenever vapors are encountered.

Dust

For all practical purposes we can define dusts as particles of solid matter divided by abrasion and fine enough to float along and to be distributed by ordinary air motion. This, of course, means bad air for breathing and if the dust is combustible a fire and explosion hazard as well.

Fume

Fumes are particles of solid matter also, but the term fume is correct only for particles formed when vapors are condensed from heating metals or other substances.

Mist

Mists are droplets of liquid so fine that they float in the air. They may be formed by condensation from the gaseous form (example, fog above a pond on a still cold morning), by gas escaping from a liquid and carrying fine droplets with it (example, chromium plating tank), or by breaking a liquid up into a very fine spray (example, air brushing).

Chemical and Physical Changes

When carbon, a black solid substance, burns in air, an invisible gas consisting of both carbon and oxygen (carbon dioxide) is formed. When milk sours, the sugar in the milk is converted into an acid, and the composition and the properties of the acid differ greatly from those of the sugar. Iron rust formed by the corrosion of iron metal contains oxygen as well as iron, and it is therefore a different substance with different properties. All such changes are called chemical changes. A chemical change always produces at least one substance entirely different in composition and properties from those that existed before the change occurred. In addition, all chemical changes are accompanied by either the formation or absorption of some form of energy.

Changes that do not alter the composition of a substance are known as physical changes. The melting of ice, the freezing of water, the conversion of water to steam, the condensation of steam to water, the dissolving of sugar in water, and the heating of iron to redness, are all examples of physical change. In each of these there is a change in properties but there is no alteration of the chemical composition of the substances involved. Water, whether in the solid, liquid, or gaseous state, retains the same chemical composition. Sugar is the same chemical substance in solution in water as it is in the solid state and can readily be recovered as crystals by evaporation of the water. Iron, an emitter of light when red hot, is still the same substance that reflects light when cold.

Skin Absorption

The intact skin (see Fig. 17-1) is an excellent barrier to passage of most chemicals, especially against most water solutions. However, some chemicals will be absorbed through the skin, while others, which will not be absorbed through the intact skin, may enter the body through cuts, blisters, or wounds. Absorption this way may be more dangerous than through the respiratory or digestive system, which may provide defensive mechanisms, since it is absorbed directly into the bloodstream. Chemicals that will be absorbed even through an intact skin include tetraethyl lead, used as a knock suppressant in high-octane gasoline, aniline, hydrazine, the boranes, and nitroglycerine.

Corrosives

Corrosives damage by chemical reaction with the skin they contact. In addition to injuring the skin and the underlying tissues, the wound provides a point of entry for the toxicant to reach the bloodstream, producing an effect worse than skin damage.

Corrosive burns can be caused by strong acids or alkalis. Alkalis can cause progressive burns, the injury increasing as the alkali moves through damaged tissue. This is especially critical in injuries to the eye, where delicate tissues can be damaged little by little until vision is destroyed. If a corrosive chemical is swallowed, it will cause pain in the mouth, throat, and stomach. There will usually be vomiting, difficulty in swallowing and breathing, distension and pain caused by gas in the stomach.

Some common corrosives are concentrated acids, such as nitric, hydrochloric, sulfuric, and oxalic; strong alkalis, such as sodium or potassium hydroxide; and reactive elements, such as iodine, chlorine, or fluorine.

The severity of a corrosive burn depends on the concentration and type of corrosive chemical, whether the contact was covered or uncovered, and the length of time of contact. For this reason, a harmful agent should be washed away as soon as possible and neutralized with a mild antidote if one is available.

A covered skin contact usually creates a severer skin reaction than one which is uncovered. Tricresyl phosphate evaporates rapidly from an uncovered skin, with a sensation of coldness and a brief mild redness. Clothing wet with tricresyl phosphate produces a burning sensation and blisters like those of a second-degree burn. Even less harmful liquids, such as gasoline, will produce similar reactions. The importance of prompt removal of contaminated clothing and of damaging chemicals is apparent.

Dermatitis

Dermatitis is skin inflammation caused by defatting of the skin or by contact with an irritating or sensitizing substance. Exposure to solvents often causes removal of the oils that keep the skin soft and pliable, making it dry, scaly, somewhat thickened, and with a tendency to crack easily. Some redness may result from the irritating effects created by the absence of fats. Such skins often have poor resistance to bacterial infection and heal slowly when injured. Replacement of oils with creams and lotions to control the condition is only partly effective. The only hope of recovery is generally removal from further

Damage

Of all skin contacts, those with the eyes are the most damaging, because of their sensitivity. Most materials have the ability to injure the eye to some degree. Solids can harm by abrasion or by chemical action. The mildest injury is probably irritation which causes redness, watering, and stinging. More severe irritation can damage the cornea, the transparent covering of the eye, involving a dry scratching feeling and various levels of pain.

A corneal burn is the commonest chemical eye injury. Corrosive vapors or fine spray can cause many tiny burn spots. Contact with a strong mineral acid or alkali can damage or destroy vision. The tendency of alkali burns to spread, even though emergency treatment has been given, makes them particularly troublesome.

A hazard that has developed in the past few years is the possibility that a sprayed or splashed corrosive material, either vapor or fine liquid, may be caught between a contact lens and the eye. This keeps the chemical in close contact with the eye for an abnormally long period, aggravating the burn.

Solvents

The solvents we are interested in are those that are hazardous. Some give off vapors that will burn and explode; for example, gasoline, naphtha, benzene, methanol (wood alcohol). Some are extremely toxic and their vapors, if breathed, can poison one; examples, benzene, carbon tetrachloride, methanol. Note that benzene and methanol present both hazards.

Carbon tetrachloride formerly was used in fire extinguishers. Its high toxicity, however, makes it unsafe in many situations, and many authorities now prohibit its further use as a fire extinguishing agent.

Another point to remember is that the higher the temperature the faster the vapors come off from the liquid. So if the process in which the solvent is used heats it up, the hazard is increased. The amount (concentration of vapor in the air) reaches the point at which it can burn or explode, or at which it can poison one more quickly than if it were not heated. That might make it seem that the hazard is greater in hot weather than cold, but this may be offset by the fact that windows and doors are likely to be kept open in summer and kept tightly closed in winter, at least wherever winters are cold.

Chemical Symbols

The chemical symbols are so universally used to indicate the chemical compounds that every safety man should know the symbols of at least the common elements. These symbols make possible a simple means of indicating the makeup (chemical formula) of each compound. For example, the formula for carbon monoxide is CO, which shows that each molecule of carbon monoxide is made up of one atom each of carbon and oxygen. Where there is more than one atom of an element in a compound a subscript is used to show it. For example, carbon dioxide is CO₂, meaning that one carbon and two oxygen atoms have combined. Water is H₂O. By adding another atom of oxygen to H₂O we get hydrogen peroxide H₂O₂, a mild solution which has long been used by women to change their brown tresses to blond. When concentrated it is a dangerously corrosive chemical. What a difference that extra little atom of oxygen makes!

We need not concern ourselves with the highly complex compounds of organic chemistry. Even the chemist uses the name if the formula is long. If it has a short trade name he will probably use that. For example, the formula for the widely used insecticide DDT is (C₁₄H₉Cl₃). Its chemical name is dichloro-diphenyl-trichloroethane. No one will ever expect anyone but a chemist to know its chemical name let alone its chemical formula. But a safety man should recognize the formula, as well as the name, for many of the chemical compounds he will encounter. Here are a few to start with.

Inorganic Compounds

Sulfuric acid—H₂SO₄
Nitric acid—HNO₃
Hydrochloric acid—HCl
Ammonia—NH₃
Caustic soda (lye)—NaOH
Caustic potash—KOH

Organic Compounds

Carbon tetrachloride—CCl₄
Ethyl alcohol (grain alcohol)—C₂H₅OH
Benzene (benzol)—C₆H₆
Toluene—C₇H₈
Methyl alcohol (methanol)—CH₃OH

Acids, Bases, and Salts

A Acids are compounds that have one or more atoms of loosely held hydrogen. This hydrogen acts as though it were dissatisfied with its partner and is always looking for one it likes better, for example, hydrochloric acid (HCl). The hydrogen atom is so dissatisfied that it will take up with almost anything. Of course, the other partner, chlorine, is not too happy either. For example, when a molecule of HCl meets up with a molecule of ordinary lye (NaOH), they swap partners fast and get hot in doing so. The reaction is HCl + NaOH = NaCl + H₂O + heat. The reaction goes fast and is likely to form steam and cause spattering or explosion.

Three acids are found in every laboratory and many plants, and are so essential that they have been referred to as the workhorses of the chemical industry. They are made and used in amounts of millions of tons per year. These acids are hydrochloric (HCl), sulfuric (H₂SO₄), and nitric (HNO₃). Because of their dissatisfied hydrogen element, they are very active chemically, they attack a very wide variety of substances including human skin and flesh and eyes. They are not flammable, that is they do not burn or explode. There is, however, the ever present possibility of leakage or spillage into materials or substances with which they can react to cause fire or explosion or liberate toxic vapors or gases. Nitric acid in particular is likely to set fire to sawdust, shavings, straw, and many other finely divided combustible materials. Both hydrochloric and nitric acids give off gas when heated and, therefore, can burst their containers. The vapors given off by nitric acid when it is heated are very dangerous when breathed in any considerable amount, they are likely to cause fatal lung damage. The vapors of HCl and H₂SO₄ are so intensely irritating that they are unbreathable. This property is a safeguard because it gives warning of even very low concentration in the air of the workroom. One gets out quickly, if he can, to get his breath and get the sting out of his eyes. If the concentration is high and he can't get out, he dies.

Acids should be stored in cool places away from the sun and away from other chemicals and waste materials. The possibility of leakage to floors below (if any) should always be taken into account. Where amounts kept are considerable, floors should be impervious to acid resisting material, and arranged to be hosed down as needed.

Provisions should be made for the safe handling of containers, particularly carboys. Various types of carboy handling equipment (hoists, carriers) are available commercially.

Protective clothing—rubber aprons, gloves, and perhaps acid resisting shoes—should be worn when handling acids. Chemical goggles or face shields should always be worn when handling acids of any kind.

NOTE. Bulletin 265, "The Inorganic Acids," of the U.S. Department of Labor Bureau of Labor Standards, contains detailed information on the hazards connected with the use and handling of acids and recommends measures for control measures.

Bases. Bases are compounds that have one or more "hydroxyl groups." A hydroxyl group is an atom of oxygen linked to an atom of hydrogen (OH). Chemically, it acts much as though it were a single atom.

We have two very active bases that are widely used: caustic soda (sodium hydroxide) (NaOH) and caustic potash (potassium hydroxide) (KOH). Their hazards are similar and we treat them the same. They are called "caustics" because they eat most organic substances—skin, fat, flesh, hair, your shoes, the wooden floor. They react with fats to form soap and glycerine. Ordinary lye is NaOH dissolved in water.

These two caustics are marketed and handled in the form of lumps, pellets, sticks, and in cans or drums of light gauge sheet steel. molten caustic is poured into a drum. It hardens on cooling to a white solid mass. The user strips the sheet metal off and chops or breaks up the caustic into pieces of convenient size. This involves the hazard of flying chips that will stick to sweaty skin and eyes. Caustics can cause very serious eye damage. Suitable protective equipment—aprons, gloves, goggles or face shields—must be worn when handling or using caustics. Also, safety should be provided for other nearby workmen.

Calcium (Ca) gives us another widely used base that, while not as caustic as caustic potash or caustic soda, offers hazards. Ordinary limestone is calcium carbonate (CaCO₃). When burned in a kiln it gives off CO₂ and becomes quicklime (CaO). If water is added to CaO it swells up, gets hot, and becomes Ca(OH)₂ (caustic lime) that is, CaO + H₂O = Ca(OH)₂. It will then take CO₂ out of the air, turn the H₂O loose and again becomes CaCO₃. This is the reaction by which lime plaster and lime mortar harden.

CaO and Ca(OH)₂ are both caustic but are much less so than NaOH and KOH. The fact that quicklime heats up on wetting has caused many fires, particularly in building supply yards. Quicklime dumped into a wooden bin, the roof leaks, fire starts in the bin and is carried to the nearby lumber. Another lumber yard got into such fires are spectacular and very expensive, all because of failure to store quicklime properly. Quicklime should be stored in concrete bins with leak-proof metal covers, preferably hinged so they can be won't be left off or thrown back. Then make doubly sure by having a good roof.

Salts. A salt is a compound, other than water, which is formed by the reaction of an acid with a base. Salts are mostly stable and well tempered compounds well satisfied with their lot in life. Some of them, however (the offspring of the "per" acids, perchloric, for example), are very touchy and blow up on very slight provocation. The salts of nitric acid (nitrates) are for the most part fairly safe but if heated with oxygen-hungry substances they may give up the oxygen and set their nitrogen free without much fuss, or they may start a fire or give off poisonous gases or both. So don't fool with nitrates unless you know them. The same is true of perchlorates and the like, only more so.

B. DOT HAZARD CLASS

Enter the two digit code from the table below which corresponds to the DOT hazard class of the waste described. If the waste described has been shipped under more than one DOT hazard class, use a separate line for each DOT hazard class.

DOT HAZARD CLASS	Code
Combustible .....	.01
Corrosive .....	.02
Etiologic agent .....	.03
Explosive A .....	.04
Explosive B .....	.05
Explosive C .....	.06
Flammable gas .....	.07
Flammable liquid .....	.08
Flammable solid .....	.09
Irritating agent .....	.10
Nonflammable gas .....	.11
Organic peroxide .....	.12
ORM-A .....	.13
ORM-B .....	.14
ORM-E .....	.15
Oxidizer .....	.16
Poison A .....	.17
Poison B .....	.18
Radioactive .....	.19

TABLE OF HAZARD CLASS PRIORITIES

Poison A
 Flammable Gas
 Flammable Liquid
 Oxidizer
 Flammable Solid
 Corrosive Material, Liquid
 Poison B
 Corrosive Material, Solid
 Irritating Materials
 Combustible Liquids
 Other Regulated Materials (ORM) E
 Other Regulated Materials (ORM) B
 Other Regulated Materials (ORM) A

most



least

DEGREE OF HAZARD

C. EPA HAZARDOUS WASTE NUMBER

For listed wastes, enter the four digit EPA Hazardous Waste Number from 40 CFR Part 261, Subpart D (see Appendix) which identifies the waste. For unlisted wastes which exhibit hazardous characteristics, enter the four digit EPA Hazardous Waste Number from 40 CFR Part 261, Subpart C (see Appendix) which is applicable to the waste.

For a mixture of more than one listed or unlisted waste, enter all of the relevant EPA Hazardous Waste Numbers. Four spaces are provided for this on each waste line. If more space is needed, continue on the next line(s), and leave all other items on that line blank, as shown by the example below. Generators who ship lab packs are currently required to list the hazardous waste number for each of the constituents of the pack.

5.2 Waste Characteristics. The hazardous substance that was observed for scoring the release category may be different from the substance used to score waste characteristics.

Reactivity and incompatibility. measures of the potential for sudden releases of concentrated air pollutants, are evaluated independently, and the highest value for either is recorded on the work sheet.

Reactivity provides a measure of the fire/explosion threat at a facility. Assign a value based on the reactivity classification used by NFPA (see Table 11). Reactivity ratings for a number of common compounds are given in Table 4.

TABLE 11.—NFPA REACTIVITY RATINGS

NFPA level	Assigned value
0 Materials which are normally stable even under fire exposure conditions and which are not reactive with water.	0
1 Materials which in themselves are normally stable but which may become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.	1
2 Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Includes materials which can undergo chemical change with rapid release of energy at normal temperatures and pressures or which can undergo violent chemical change at elevated temperatures and pressures. Also includes those materials which may react violently with water or which may form potentially explosive mixtures with water.	2
3 Materials which in themselves are capable of detonation or of explosive decomposition or of explosive reaction but which require a strong initiating source or which must be heated under confinement before initiation. Includes materials which are sensitive to thermal or mechanical shock at elevated temperatures and pressures or which react explosively with water without requiring heat or confinement.	3
4 Materials which in themselves are mostly capable of detonation or of explosive decomposition or explosive reaction at normal temperatures and pressures. Includes materials which are sensitive to mechanical or localized thermal shock.	4

TABLE 12.—INCOMPATIBLE MATERIALS

In the table below, the mixing of a Group A material with a Group B material may have the potential consequences as noted.

Group 1-A	Group 1-B
Acetylene sludge	Acid sludge.
Alkaline caustic liquids	Acid and water.
Alkaline cleaner	Battery acid.
Alkaline corrosive liquids	Chemical cleaners.
Alkaline corrosive battery	Electrolytic acid.
Rust	
Caustic wastewater	Etching acid liquid or solvent.
Lime sludge and other lime-based sludges	Pickling liquor acid other corrosive acids.
Lime wastewater	Spent acid.
Lime and water	Spent mixed acid.
Spent caustic	Spent sulfuric acid.
Potential consequences: Heat generation, violent reaction.	
Group 2-A	Group 2-B
Aluminum	Any waste in Group 1-A or 1-B.
Beryllium	
Calcium	
Lithium	
Potassium	

TABLE 12.—INCOMPATIBLE MATERIALS—Continued

In the table below, the mixing of a Group A material with a Group B material may have the potential consequences as noted.

Group 3-A	Group 3-B
Sodium	
Zinc powder	
Other reactive metals and metal hydrides.	
Potential consequences: Fire or explosion, generation of flammable hydrogen gas.	
Group 4-A	Group 4-B
Alcohols	Any concentrated waste in Groups 1-A or 1-B.
Water	Calcium.
	Lithium.
	Metal hydrides.
	Potassium.
	SO ₂ , SO ₃ , PO ₂ , O ₂ , SO ₂ .
	Other water-reactive waste.
Potential consequences: Fire, explosion, or heat generation, generation of flammable or toxic gases.	
Group 5-A	Group 5-B
Alcohols	Concentrated Group 1-A or 1-B wastes.
Aldehydes	Group 2-A wastes.
Halogenated hydrocarbons.	
Nitrated hydrocarbons.	
Unsaturated hydrocarbons.	
Other reactive organic compounds and solvents.	
Potential consequences: Fire, explosion, or violent reaction.	
Group 6-A	Group 6-B
Spent cyanide and sulfide solutions.	Group 1-B wastes.
Potential consequences: Generation of toxic hydrogen cyanide or hydrogen sulfide gas.	
Group 7-A	Group 7-B
Chlorates	Acetic acid and other organic acids.
Chlorine	Concentrated mineral acids.
Chlorides	Group 2-A wastes.
Chromic acid	Group 4-A wastes.
Hypochlorites	Other flammable and combustible wastes.
Nitrates	
Nitric acid, fuming	
Perchlorates	
Permanganates	
Peroxides	
Other strong oxidizers	
Potential consequences: Fire, explosion, or violent reaction.	

Source: Hazardous Waste Management Law, Regulations, and Guidelines for the Handling of Hazardous Waste, California Department of Health, Sacramento, California, February 1975.

Incompatibility provides a measure of the increased hazard when hazardous substances are mixed under uncontrolled conditions, leading to production of heat, pressure, fire, explosion, violent reaction, toxic dusts, mists, fumes or gases, or flammable fumes or gases. Table 12 provides examples of incompatible combinations of materials.

7.0 Fire and Explosion

Compute a score for the fire and explosion hazard mode, S_{FE} , when either a state or local fire marshal has certified that the facility presents a significant fire or explosion threat to the public or to sensitive environments or there is a demonstrated fire and explosion threat based on field observations (e.g., combustible gas indicator readings). Document the threat.

7.1 Containment. Containment is an indicator of the measures that have been taken to minimize or prevent hazardous substances at the facility from catching fire or exploding. Normally it will be given a value of 3 on the work sheet (Figure 11). If no hazardous substances that are individually ignitable or explosive are present and those that may be hazardous in combination are segregated and isolated so that they cannot come together to form incompatible mixtures, assign this factor a value of 1.

7.2 Waste Characteristics. Direct evidence of ignitability or explosion potential may exist in the form of measurements with appropriate instruments. If so, assign this factor a value of 3; if not, assign a value of 0.

Additional information can be obtained from *A Method for Determining the Compatibility of Hazardous Wastes*, H. K. Matsuyama, et al., EPA-600/2-80-078 (1980). Assign a value using the following guidance:

Incompatibility	Assigned value
No incompatible substances are present	0
Present but do not pose a hazard	1
Present and may pose a future hazard	2
Present and posing an immediate hazard	3

Toxicity should be rated for the most toxic of the substances that can reasonably be expected to be transported away from the facility via the air route. Using the information given in Tables 4, 6, and 7, assign values as follows:

Toxicity	Assigned value
See level 0 or NFPA level 0	0
See level 1 or NFPA level 1	1
See level 2 or NFPA level 2	2
See level 3 or NFPA levels 3 or 4	3

PARTIAL LIST OF INCOMPATIBLE CHEMICALS *

Substances in the right-hand column should be stored and handled so they cannot possibly contact corresponding substances in the left-hand column.

Alkaline and alkaline earth metals, such as sodium, potassium, cesium, lithium, magnesium, calcium, aluminum

Carbon dioxide, carbon tetrachloride, and other chlorinated hydrocarbons. (Also prohibit water, foam, and dry chemical on fires involving these metals.)

Acetic acid

Chromic acid, nitric acid, hydroxyl containing compounds, ethylene glycol, perchloric acid, peroxides, and permanganates

Acetone

Concentrated nitric and sulfuric acid mixtures.

Acetylene

Chlorine, bromine, copper, silver, fluorine, and mercury

Ammonia (anhyd.)

Mercury, chlorine, calcium hypochlorite, iodine, bromine, and hydrogen fluoride.

Ammonium nitrate

Acids, metal powders, flammable liquids, chlorates, nitro-sulfur, finely divided organics or combustibles.

Aniline

Nitric acid, hydrogen peroxide.

Bromine

Ammonium, acetylene, butadiene, butane and other petroleum gases, sodium carbide, turpentine, benzene, and finely divided metals.

Calcium carbide

Water (see also acetylene).

Calcium oxide

Water.

Carbon, activated

Calcium hypochlorite.

Copper

Acetylene, hydrogen peroxide.

Chlorates

Ammonium salts, acids, metal powders, sulfur, finely divided organics or combustibles.

Chromic acid

Acetic acid, naphthalene, camphor, glycerine, turpentine, alcohol, and other flammable liquids.

Chlorine

Ammonia, acetylene, butadiene, butane and other petroleum gases, hydrogen, sodium carbide, turpentine, benzene, and finely divided metals.

Chlorine dioxide

Ammonia, methane, phosphine, and hydrogen sulfide.

Fluorine

Isolate from everything.

Hydrocyanic acid

Nitric acid, alkalis.

Hydrogen peroxide

Copper, chromium, iron, most metals or their salts, any flammable liquid, combustible materials, aniline, nitromethane, caustic soda and other strong alkalis.

Hydrofluoric acid, anhyd. (Hydrogen fluoride)

Ammonia, aqueous or anhydrous.

Hydrogen sulfide

Fuming nitric acid, oxidizing gases.

Hydrocarbons (benzene, butane, propane, gasoline, turpentine, etc.)

Fluorine, chlorine, bromine, chromic acid, sodium peroxide.

Iodine

Acetylene, ammonia (anhyd. or aqueous).

Mercury

Nitric acid (conc.)

Nitroparaffins

Oxygen

Oxalic acid

Perchloric acid

Peroxides, organic

Phosphorus (white)

Potassium Chlorate

Potassium perchlorates

Potassium permanganate

Silver

Sodium

Sodium nitrate

Sodium oxide

Sodium peroxide

Sulfuric acid

Zirconium

Acetylene, fulminic acid, ammonia.

Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, and nitritable substances.

Inorganic bases.

Oils, grease, hydrogen, flammable liquids, solids or gases

Silver, Mercury.

Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils.

Acids (organic or mineral); avoid friction.

Air, oxygen.

Acids (see also chlorate).

Acids (see also perchloric acid).

Glycerine, ethylene glycol, benzaldehyde, sulfuric acid,

Acetylene, oxalic acid, tartaric acid, ammonium compounds

See alkaline metals (above).

Ammonium nitrate and other ammonium salts.

Water.

Any oxidizable substance, such as ethanol, methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, methyl acetate, and furfural.

Chlorates, perchlorates, permanganates.

Prohibit water, carbon tetrachloride foam, and dry chemical on zirconium fires.

* Based on Dangerous Chemicals Code, 1951 Edition, pp. 19-20, Bureau of Fire Prevention, City of Los Angeles, Fire Department, published by Parker & Company, Los Angeles 13, California.

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Lansing, Michigan 48909

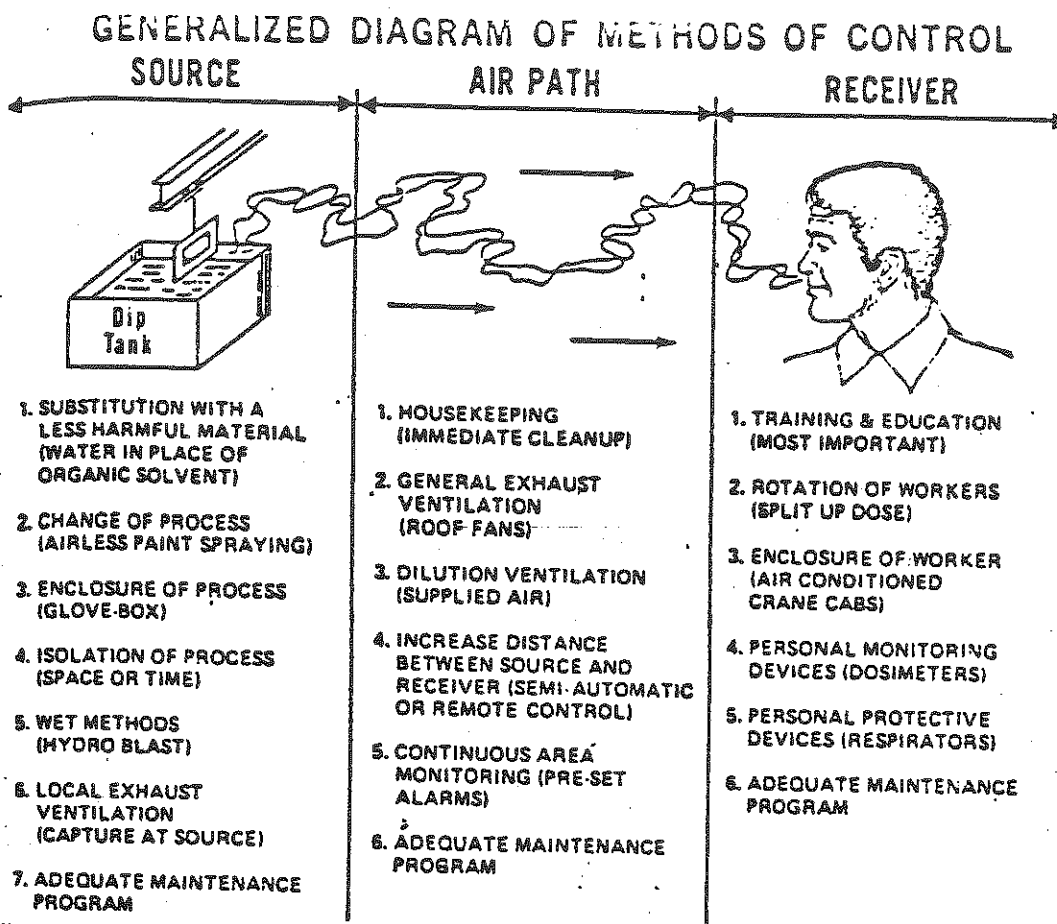
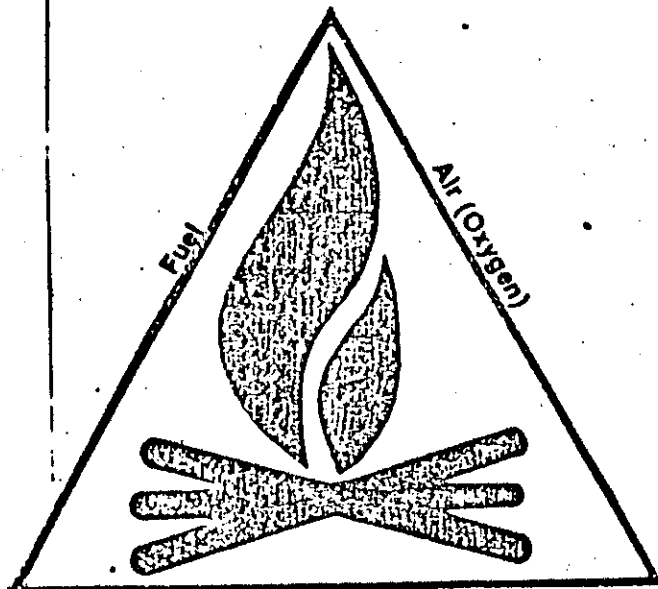


FIGURE 20-1.—To determine the extent of exposure, locate the contaminant source, the path it travels to the worker, and the employee's work pattern and use of protective equipment.

Kinds of Protective Equipment

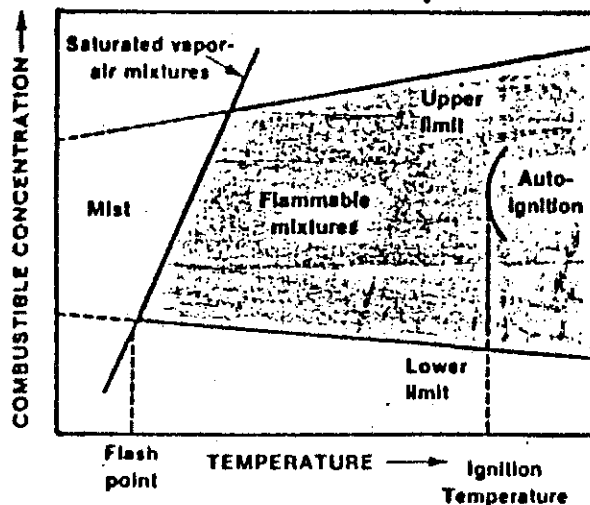
There are two broad categories of protective devices: protective clothing and respiratory protective equipment. Though there are far too many different kinds of items to cover them all in this handbook, a few things can be said about the two basic categories:

- Protective clothing is meant to keep dangerous materials from coming into contact with skin, eyes, and other parts of the body. Some items — rubber boots and aprons, for example — are totally impermeable and let nothing get through to the body surface. Other articles — your ordinary work clothes, for instance — let the air get through but keep out much of the dust and soil.
- Respiratory protective devices are breathing machines. Some devices are meant to supply you with air through a mask and hose where there is none to breathe in your work area or where the air is too dirty to breathe. Others are designed to filter out contaminants by various methods.



Heat

Fuel, oxygen, and heat must be present at the same time for a fire to occur.



Effect of Temperature on Limits of Flammability of a Combustible Vapor in Air.

BASIC CONCEPTS

Most fires are the result of a chemical reaction between a fuel and the oxygen in the air. Materials such as methane, wood, coal, oil, grease, rags, and many plastics will burn when ignited in the presence of air. In each case, three ingredients are needed for an ordinary fire to occur: fuel, oxygen, and heat.

The Fire Triangle

These three ingredients (fuel, oxygen, heat) must be present at the same time for the fire to occur. If any one is removed, the fire will go out; more important, if one is missing, the fire will not start. A triangle can be used to illustrate this basic principle. Each side of a triangle is given one of the labels: fuel, oxygen (or air), or heat. If any one is removed the fire goes out.

Classes of Fires

For firefighting purposes, fires are now classified into four groups:

- Class A** those that involve ordinary combustible materials such as wood, coal, plastics, paper and cloth. They are best extinguished by cooling with water or by blanketing with certain dry chemicals.
- Class B** those that involve vapors above flammable or combustible liquids such as gasoline, diesel fuel, kerosene, and grease. They are best extinguished by excluding air or by special chemicals that affect the burning reactions.
- Class C** those that involve combustible materials in electrical equipment. They are extinguished by nonconducting extinguishing agents such as carbon dioxide and certain dry chemicals.
- Class D** those that involve combustible metals such as magnesium, titanium, zirconium, sodium, and potassium. They are extinguished by special extinguishing agents designed for such applications.



Class A Ordinary combustibles
(wood; coal; paper)



Class B Flammable liquids
(gasoline; diesel fuel; kerosene)



Class C Electrical



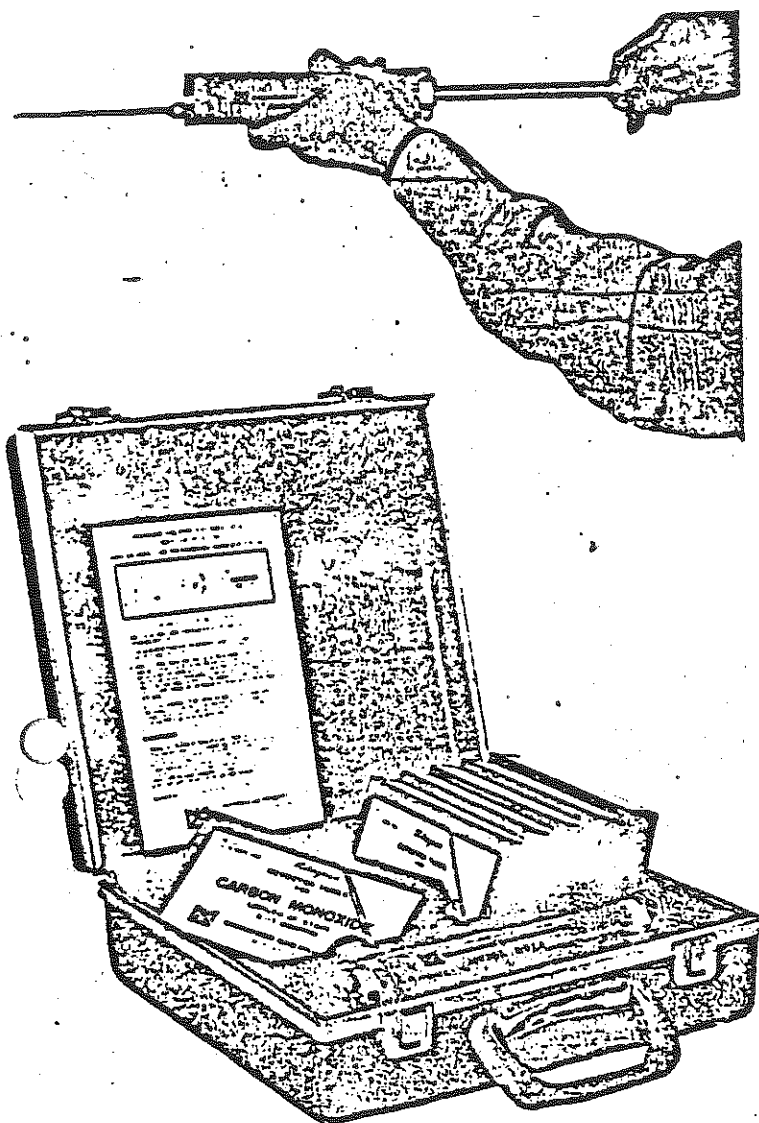
Class D Metals
(magnesium; titanium)

Extinguishers are now labeled with special color-coded symbols (A, B, C, D) to indicate the class or classes of fires on which they can be used.

Class A - green triangle
Class B - red square
Class C - blue circle
Class D - green star

Toxic Gas Detector

Matheson-Kitagawa Toxic Gas Detector



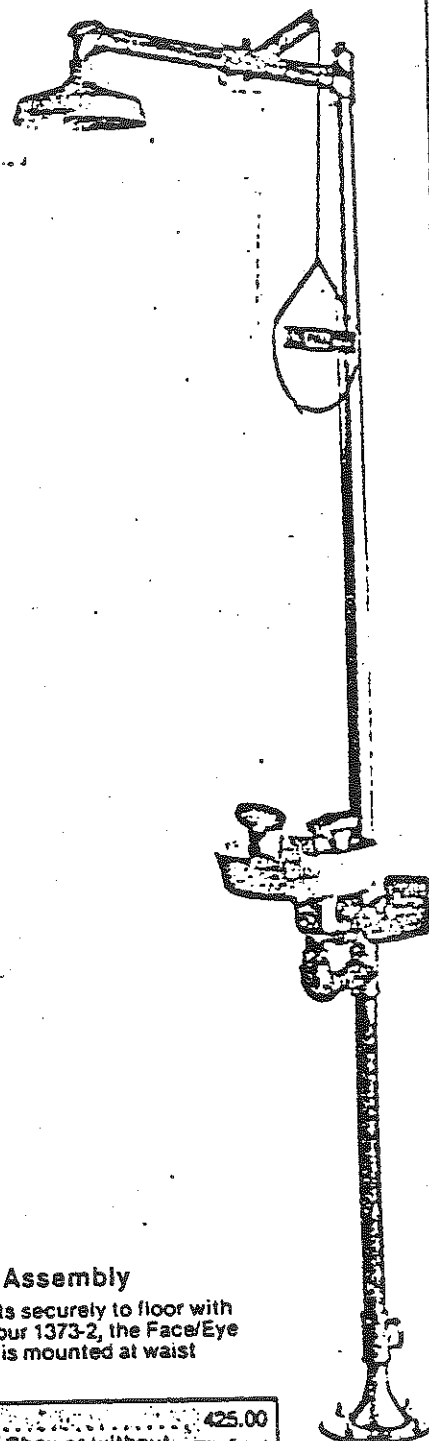
- Simple to use — easily operated by non-technical employees.
- Portable — lightweight, compact unit in a high impact plastic carrying case.
- Precise — the precision sampling pump is the key to accurate results using Kitagawa detector tubes.

An accurate and inexpensive method for determining the level of toxic vapors in lab or plant. Gives on-the-spot results to eliminate the need for expensive monitoring systems. Simply draw in a sample of the atmosphere through the detector tube and determine the concentration by comparing color changes within the tube. Detector comes in sturdy, high-impact carrying case with accessories and space for carrying detector tubes. Detector tubes are available for a variety of toxic vapors and come packaged in box for 10 tubes unless otherwise indicated. Pump is NIOSH Certified. Detector tubes are direct reading.

B1446-1 165.00

Emergency Showers

Emergency Showers



Shower/Face Wash Assembly

This assembly mounts securely to floor with a 8" floor flange. On our 1373-2, the Face/Eye Wash (same as 1368) is mounted at waist height.

B1373-2	425.00
B1373-3 Drench Shower without Face Wash Assembly	235.00

*Medical and industrial experience have shown that the optimal first aid prior to medical treatment for chemical splash consists of a 15 minute flushing of the injured part of the body with water with clothing removed. Safety showers must be within 10 seconds or 100 foot travel distance of a hazardous area (newly developed ANSI standard Z358.1). Where extremely hazardous conditions exist, showers should be located 10-20 feet from the source of hazard. Consult a physician for recommendation.

Sample Procedure For Entry Into Confined Spaces

I. Definition

A confined space is any relatively small enclosed or restricted space without proper life supporting atmosphere or in which mobility is restricted, such as, but not limited to; a bin, furnace, cupola, tank, pressure vessel, vault, well, boiler, or small compartment of a ship.

II. Training

All employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, including prior testing and purging if needed, the use of required protective and emergency equipment, and proper procedures for entering and working in such areas.

III. Lockout

Prior to any employee entering any confined space, controls to equipment supplying or operating the device to be entered, or any device contained in the space, shall be locked out, valves to supply pipes serving the device or any device within the space shall be locked out or blanked, and any sewer or drain lines serving the space shall be blanked.

IV. Testing

Before an employee is permitted to enter a confined space, the air in the space shall be tested with an approved device to determine if there is a deficiency of oxygen, the presence of toxic gas or vapor in excess of maximum allowable limits prescribed by the Department of Public Health, or an explosive atmosphere.

V. Precautions

A. An employee shall not enter a confined space having an explosive atmosphere unless involved in correcting a condition which caused the explosive atmosphere and the condition cannot be corrected by any other means and the atmosphere cannot be purged below the explosive limit. All sources of ignition shall be prohibited in or around the space.

- B. If the atmosphere in the space is found to be either oxygen deficient or toxic, either ventilation shall be provided in a quantity that eliminates the hazard or respiratory equipment prescribed by the Department of Public Health shall be worn.
- C. A lifeline and safety harness shall be worn by an employee entering a confined space. These shall be so attached that the employee's body cannot be jammed in a small exit opening.
- D. Another employee trained in rescue procedures and equipped with the means necessary to effect a rescue shall be stationed outside the confined space in a position to watch the employee inside the space.
- E. If rescue efforts would involve lifting the employee vertically to remove him from the space, then a second employee must be in the immediate vicinity to assist the employee stationed at the entrance to the space, or a mechanical means to lift the employee out of the confined space shall be provided before work starts.
- F. Confined space entry procedures should be posted at the entry of each confined space or other appropriate locations subject to entry by employees.

For MIOSHA safety standards covering confined spaces refer to construction standard Part 1, Rule 112, General Industry Standard Part 1, Rule 16 and Health Standard Rules 3301 and 6402.

**Say yes to
Michigan!**



and a safer workplace

**MICHIGAN DEPARTMENT OF LABOR
SAFETY EDUCATION AND TRAINING DIVISION
7150 HARRIS DRIVE, P.O. Box 30015
LANSING, MICHIGAN 48909**

CONFINED SPACE (kən-fīn'ed, spās) N.

"Confined space" means a space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks; process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth, such as pits, tubs, vaults, and vessels.

FORD-ALLEN PARK CLAY MINE LANDFILL
EPA I.D. #980568711

Hazardous Waste Employee Training Schedule

Personnel Listed Have Worked Or Are Available To Work At The Facility

Employee		Training Date					
Abernathy, Jim		5/16/81	4/5/83				
Adamson, Jim	Operating Engineer	5/16/81					
Bannerman, Marvin		5/16/81	4/5/83				
Barkman, Al		5/16/81					
Bowers, Kathy		4/5/83					
Bridges, L.		4/7/83					
Briggs, Bob		5/16/81					
Brennan, Jim	Foreman - Inspector	4/21/83	2/5/83	3/6/83	3/6/83		
Cieslak, Joe	Manifest Checker	4/5/83	2/5/84				
Cummings, Bill	Operating Engineer	5/16/81					
Curry, Chuck		5/16/81					
Cusenza, Dave		5/16/81	4/5/83				
Davis, Pete	Foreman - Inspector	4/5/83					
Fain, R.		4/7/83					
Gracey, Dale		5/16/81					
Hawthorne, Allen		5/16/81	4/5/83				
Hayes, Mike		5/16/81					
Jasso, L.		4/7/83					
Johnson, Lowell		5/16/81	4/5/83				
Knox, Willie	Operating Engineer	5/5/83					
Oliverrio, Tony		5/16/81	4/5/83				
Rank, L.		4/7/83					

- 2 -

Employee		Training Date					
Ray, Ann	Manifest Checker	4/5/83					
Richardson, Virgil	Operating Engineer	4/5/83					
Smith, Ray		5/16/81					
Strong, Murry	Operating Engineer						
Swiencki, Dave							
Sule, Ron	Manifest Checker	8/7/83	3/7/84				
Van Houten, Al							
Walker, Murry	Operating Engineer	10/5/82	10/5/83				
Weingartz, John	Operating Engineer	4/7/83	3/7/84				
Wujek, Dan	Manifest Checker	7/14/83	14/5/83	3/7/84			
Ferrantino, Mike	Foreman - Inspector	2/8/84	3/7/84				
Evans, Stanley		3/7/84					
Dominski, Robert		3/7/84					

H-1c Training Director 40CFR 264.16 (a) (2)

The Ford Motor Company Training Program has been provided to date by the Facility Training Director, Mr. David S. Miller. Mr. Miller received his B.S. degree in geology from the University of Michigan in 1977 and has been involved with hazardous waste management since the effective date of the RCRA regulations. His experience in this field is as follows:

1980 - 1981 Environmental Coordinator for three hazardous waste treatment facilities. Developed facility operational, recordkeeping, and training procedures in compliance with RCRA and Michigan PA 64.

1981 - 1984 Environmental Coordinator for the APCM landfill. Developed operational, recordkeeping, and training procedures in compliance with RCRA and Michigan PA 64.

H-1d Relevance of Training to Job Position 40CFR 264.16 (a) (2)

The job descriptions and job training program indicate that the training provided is relevant to the job position.

H-1e Training for Emergency Response 40CFR 264.16 (a) (3)

Emergency response training is provided as shown in section H1-b.

H-2 Implementation of Training Program 40CFR 264.16 (b)

Documentation of the training provided is included in the facility notebook.

Examples of such documentation are as Attachment 22.

DOCUMENT OF HAZARDOUS WASTE TRAININGANNUAL REVIEW

Training Session Date: 10-05-83

Place: Job Site

Trainee: Murray D. Walker
Ford Motor Company Employee

Previous Experience: Twenty-one years of experience as landfill bulldozer operator. Previously handled all wastes at the landfill prior to Act 64.

Aspects of Training: Waste characteristics and their physical properties were discussed in detail. General inspection items and procedures including waste verification were discussed. Pertinent waste handling and disposal regulations, particularly the management of run-off and run-on were addressed. Spill and Accident Prevention Plan, Contingency Plan and Emergency Procedures were discussed along with safety procedures and procedures for using, inspecting, repairing and replacing emergency and safety equipment. Fill and grading procedures for the site were studied.

Training Director: David S. Miller - Rouge Steel Company

Murray D. Walker

DOCUMENT OF HAZARDOUS WASTE TRAINING

Training Session Date: 05-05-83

Place: Job Site

Trainee: Willie B. Knox
Ford Motor Company

Previous Experience: Three years of experience as landfill bulldozer. Previously handled all wastes at the landfill in Act 64 as the alternate operator. Fourteen years experience as heavy equipment operator for Company.

Aspects of Training: Waste characteristics and their physical properties discussed in detail. General inspection items and procedures including waste verification were discussed. Pertinent waste handling and disposal regulations, particularly the management of run-off and run-on addressed. Spill and Accident Prevention Plan, Plan and Emergency Procedures were discussed along with safety procedures and procedures for using, inspecting, repairing and replacing emergency and safety equipment. Fill and grading procedures for the site were discussed.

Training Director: David S. Miller - Rouge Steel Company

-320-

Willie Knox 5-17-83

Certification of Training

Facility ID: Wayne Disposal, Inc. MID 048 090 633

Employee Name: JOSEPH CIESLAK

Employer: WAYNE DISPOSAL

Job Title: MANIFEST CHECKER

Course: 55

- Program Elements:
- *1. Hazardous waste rules & regulations; what is hazardous waste; chemical & physical properties.
 2. Discussion and use of appropriate safety and emergency equipment.
 3. Review and discuss all elements of contingency plan & emergency procedures.
 4. Review and discuss facility inspection reports.
 5. On going training of professional and supervisory personnel with respect to regulations changes and/or the up grading of job related skills through professional development programs such as conferences, seminars or course work.
 - ⑥ 6. Toxic & physical effects of hazardous substances including routes of entry into the body and dose/response relationship.
 7. Update on contingency plan & emergency procedures.

I participated in a training program on 2/8/1984
covering the following topics referenced above:

Elements: 6

(Signature)

Joseph Cieslak

Michigan Hazardous Waste Industry Training Program
Director: Mike Tillotson

Ford Allen Park Clay Mine

MID 980 568711

Section I Closure and Post Closure

Provided in this section is the:

- . Closure Plan and Cost Estimate
- . Post Closure Plan and Cost Estimate
- . Notice in Deed
- . Financial Test for Closure and Post Closure
- . Liability Requirements

Ford Allen Park Clay MineLandfill Closure PlanJuly 1, 1984

Site Name: Ford Allen Park Clay Mine

Site I.D. No.: MID980568711

Owner's Name: Ford Motor Company, c/o Rouge Steel Company,
Mining Properties, Room 2042, Rouge Office
Building, 3001 Miller Road, Dearborn, Michigan
48121

Site Address: 17250 Oakwood Blvd., Allen Park, Michigan 48101

Telephone: (313) 336-5725

Contact: J. S. Amber
628 West Parklane Towers
Dearborn, Michigan
(313) 322-4646

General Conditions: The overall landfill site is composed of approximately 183 acres of non-hazardous solid waste landfill, 17 acres of hazardous waste landfill, and 33 acres of greenbelt. The 17 acre hazardous waste disposal area is divided into two 8 acre cells. Cell I operates under interim status, and Cell II will operate under a permit.

Waste types FO16 (later removed from list by EPA), KO61, KO87, DO05, and DO08 were landfilled in Cell I. Waste types KO61, KO87, FO06, DO06, DO07, and DO08 are to be landfilled in Cell II.

The entire site is underlain by an insitu uniform clay deposit. An artesian aquifer is located 40 feet below the cell bottoms with a hydrostatic head of 80 feet. These conditions will prevent migration of leachate out of the liner during the active life of the operation.

I-1 Closure Plans 40 CFR 270.14(b)(13) (Cont'd)

General Conditions: (Cont'd) Leachate collection systems will function in both Cell I and Cell II. Two sumps will be installed in each cell. Partial closure will involve Cell I.

Gas generation is not predicted for ~~this fill~~ because the waste types have no decomposition products. There has been no end use designated for this site.

I-1a Closure Performance Standard 40 CFR 264.112(a)(1)

Closure will provide a secure cover system which minimizes potential leachate generation. Proper compaction and stabilization of waste before and during closure will minimize the potential fill settlement and associated post-closure maintenance.

I-1b Partial Closure and Final Closure Activities 40 CFR 264.112(a)(1)

Partial closure is anticipated for Cell I in the year 1990, based on historical fill rates and will involve the installation of a final cover system. The maximum extent of facility operation subject to closure during the life of the facility is after partial closure of Cell I when the entire area of Cell II has received some waste. This maximum area would be approximately 10 acres. The final closure involves the continuing installation of the final cover system and is scheduled for completion on June 30, 2005. Refer to Attachment 23 for details concerning the cover system which will be utilized for both Cell I and Cell II. The design engineering drawings are provided as part of Attachment 23.

I-lb

Partial Closure and Final Closure Activities 40 CFR 264.112(a)(1)

(Cont'd)

Schedule of Activities for Partial Closure (Cell I)

March 31, 1990	-	Final waste acceptance date.
March 31, 1990	-	On-site disposal completed.
April 30, 1990	-	Facility decontaminated.
May 15, 1990	-	Finish grade and proof roll liner bedding.
May 30, 1990	-	Complete installation of 10 mil FML.
June 15, 1990	-	Complete installation of FML protection/ drainage layer.
July 15, 1990	-	Complete construction of clay cap.
August 1, 1990	-	Complete final grading of topsoil.
September 15, 1990	-	Fertilize, Seed, and mulch to establish final cover crop.
Total time required	-	168 Days

If it is not possible to complete the partial closure within this schedule, Ford Allen Park Clay Mine must submit a written request to the Regional Administrator for a longer partial closure period pursuant to 40 CFR 265.113(b).

I-lc

Maximum Waste Inventory 40 CFR 264.112(a)(2)

Not applicable. An inventory of waste is not maintained at the site.

I-ld

Inventory Removal, Disposal or Decontamination of Equipment
40 CFR 264.112(a)(3)

The bulldozer utilized in working the fill will be scraped with a shovel as the decontamination procedure.

I-le 1(a) Not applicable.

I-le 1(b) Waste Stabilization 40 CFR 270.17(g)

The waste will be compacted and stabilized as part of the operation. The bulldozer will work the material so that the fill is capable of supporting the incoming truck traffic. If waste types (sludges) do not have physical characteristics that are suitable for adequate compaction or bearing strength, then additional material will be added to the fill to provide for proper bearing strength. Stabilizing the waste in this ongoing manner will minimize potential settlement of the final cover system.

- I-le(2) Cover Design 40 CFR 270.17(g)
- (3) Minimization of Liquid Migration
 - (4) Maintenance Needs
 - (5) Drainage and Erosion
 - (6) Settlement and Subsidence
 - (7) Cover Permeability
 - (8) Freeze/Thaw Effects

Cover design as it applies to the above concerns is addressed in the following report (Attachment 23).

I-lf Continuance of Operations 40 CFR 270.14(b)(13)

Closure period will have no effect on the monitoring program or the controls for run-on and run-off. Wind dispersion controls (daily cover over the waste) will remain in effect.

I-lg Schedule for Closure 40 CFR 264.112(a)(4)

<u>Dates*</u>	<u>Activities</u>
August 31, 2004	Notify Regional Administrator of closure.
March 31, 2005	Final waste acceptance.
March 31, 2005	On-site disposal completed.
April 30, 2005	Facility decontaminated.
May 15, 2005	Finish grade and proof roll liner bedding.
May 30, 2005	Complete installation of 10 mil FML.
June 15, 2005	Complete installation of FML protection/ drainage layer.
July 15, 2005	Complete construction of clay cap.
August 1, 2005	Complete final grading of topsoil.
September 15, 2005	Fertilize, seed, and mulch to establish final cover crop.
Total time required - 168 days**	

* These dates are estimates.

** Dependent on the actual date of receiving the last shipment of waste and potential seasonal limitations on activities such as soil compaction, synthetic liner application, and planting vegetation.

I-lh Extension for Closure Time 40 CFR 264.113(a)

If necessary, a petition for a schedule which exceeds 180 days for completion of closure activities which justifies that a longer period of time is required.

CLOSURE PLAN - FINAL COVER
(Prepared by Neyer, Tiseo & Hindo, Ltd.)

Introduction

The following is an evaluation of the proposed final cover to be used for Cell II in the hazardous waste management area at the Ford Motor Company's Allen Park Clay Mine Landfill site. This evaluation is required under provisions of 40 CFR 270.14 (b)(13) and 270.21 (e). Provisions relating to the cover requirements are included in 40 CFR 264.310 (a). The proposed final cover is evaluated herein with respect to its ability to 1) provide long-term minimization of percolation into the landfilled waste, 2) function with a minimum of maintenance, 3) promote drainage while minimizing erosion, and 4) maintain integrity despite settlement of the landfilled waste surface. Additionally, 40 CFR 264.310 (a) requires that the cover possess a permeability less than or equal to the permeability of the leachate containment system at the base of the landfill.

This report has been prepared for the exclusive use of the Rouge Steel Company, the U.S. Environmental Protection Agency, and the Michigan Department of Natural Resources for the specific purpose expressed above. It is intended only to serve as a portion of the Part B permit application under the requirements of 40 CFR 270.

Description of Design

The proposed cover system, exclusive of vegetative cover, is presented in the design plans. Basically, the proposed cover consists of five elements. From the ground surface downward, these are:

- 1) a minimum of 4 inches of topsoil,
- 2) a minimum of 3 feet of compacted clayey soil possessing a Unified Soil Classification of CL or CH,
- 3) a minimum of 1 foot of a drainage blanket consisting of sand meeting the requirements of MDOT Class II granular material,
- 4) a PVC membrane liner 10 mils in thickness,
- 5) a bedding consisting of at least 1 foot of compacted silt, clayey silt, or silty clay possessing a Unified Soil Classification of ML, CL-ML, or CL.

The proposed surface slopes will range generally from 3 to 5 percent. The proposed vegetative cover will include a mixture of rye, fescue and bluegrass.

Additionally, it is proposed that the drainage blanket placed above the PVC membrane will be drained at the lower cell boundary with a perforated drain leading into outlet pipes. The outlet pipes will discharge off the landfill cover.

Construction

The performance of the proposed cover in the manner discussed herein will depend upon proper construction of the system. It is intended that the following procedures and requirements will be incorporated into the cover construction.



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Following compaction and smoothing of the final, uppermost waste surface, placement of the silt and/or clay bedding layer will proceed prior to placement of the PVC membrane. Compaction of this bedding will be performed insofar as permitted by the underlying waste; however, high densities will not be required. Care will be taken in the final grading of this bedding such that no sharp objects which could possibly penetrate the cover membrane will protrude above the top surface. It is intended that the PVC installation will be performed with care according to the manufacturers instructions. Following placement of the sand drainage blanket on the membrane, the clayey soil cap will be placed. Placed in lifts (maximum loose thickness of 12 inches), the clay cap will be compacted to achieve 90 percent of the maximum dry density as determined in accordance with the Modified Proctor test (ASTM D-1557). The moisture content of this fill should be kept within 2 percent below and 5 percent above the optimum as defined by ASTM D-1557. Proposed design specifications for the cover system are included with the permit application.

Throughout the placement, it is intended that no frozen material be used as fill nor any material be placed upon a frozen base. It is also intended that final placement of topsoil and establishment of the vegetation be performed expeditiously to minimize potential erosion.

Function of System Components

The topsoil will provide the medium for vegetative root establishment and nourishment. The vegetative cover which will be supported by the topsoil will be selected to minimize soil erosion. The compacted clayey soil beneath the topsoil will minimize percolation into the underlying granular drainage blanket. It will also provide protection for the deeper PVC membrane and will provide soil moisture storage for support of the vegetative cover. The granular drainage blanket serves two purposes. First, the blanket drain will transmit any water which has percolated through the compacted clay soil component off the landfill cell. Second, the drainage blanket will act to prevent frost action problems by minimizing the moisture available for ice lens formation within the compacted clayey soil layer. The PVC membrane will serve to intercept downward percolating moisture so that the drainage blanket can transmit the moisture off the cell cover. Lastly, the underlying fine-grained soil layer will serve as a compacted, stable bedding on which to place the PVC membrane.

The compacted clayey soil layer component and basal bedding layer will consist of soil materials obtained on site.

Minimization of Percolation

Percolation of precipitation into the landfill is minimized by three components of the system. Vegetative cover growing on the topsoil layer serves to minimize percolation by returning soil moisture to the atmosphere through evapotranspiration during the growing season. The compacted clayey soil component will maximize runoff and will, therefore, minimize the percolation of soil moisture into the underlying granular drainage blanket. Finally, the PVC membrane which is to underlie the drainage blanket will, for all practical purposes, prevent the vertical migration of moisture into the fill below.

When properly installed and constructed, this system effectively combines the advantages of both the compacted clay and the PVC membrane. Disadvantages in either individual component in the system are compensated by advantages in the other component.



NEVER, TISED & HUNDO, Ltd.

...ly due to settlement occur in the compacted clayey layer, the PVC membrane remain unaffected. Similarly, the compacted clayey cover serves as a blanket for the PVC membrane from the effects of shallow cover disturbance degradation due to ultraviolet light.

Hence, the proposed cover system should provide for short and minimization of percolation. As will be discussed later, this depends on installation and construction techniques, the establishment of the vegetative cover, and the diligent application of a long-term inspection and maintenance program.

Maintenance

The proposed cover system will require regular maintenance only as the vegetative cover is concerned. Proposed maintenance of the vegetation will be performed to minimize the establishment of native, undesirable species as deep-rooted, woody plants. Other potential efforts might include occasional mowing, fertilization, or even reseeding if determined to be necessary as below.

Other maintenance efforts will generally be limited to careful, frequent inspections (condition surveys) and repair of any problems identified during inspections. Proposed inspections will specifically be directed toward the detection of: invasion by undesirable plant species; deterioration of the vegetative cover; areas of surface erosion; soft, wet or unstable areas of the cover; damage to the dikes; obstructions, erosion or deterioration of the surface features; disruption of drainage grades due to settlement; obstructions or damage to the discharge pipes for the drainage layer; burrowing by animals; or surface disturbance due to excavation or unwarranted vehicle traffic.

Detection of problems such as those presented above will require regular efforts. The proposed remedial efforts will be undertaken to bring the cover to the original designed condition insofar as possible.

Erosion, Frost Action and Drainage

Generally uniform slopes are planned for the proposed cover system. These slopes will range from approximately 3 percent to 5 percent. The use of compacted silty clay (CL) directly beneath the topsoil will promote runoff.

Establishment and maintenance of a vegetative cover will serve to minimize erosion due to both runoff and wind. It is proposed that this vegetative cover will consist of a hardy grass mixture which will require a minimum of effort to maintain full, thick growth on the entire cover surface. Deep-rooted woody plants will not be used and their future establishment will be discouraged through a long-term inspection and maintenance program. As previously discussed, placement of topsoil for the establishment of the vegetative cover is planned.

The universal soil loss equation as presented in Lutton (1982) has been applied to the proposed cover system. The analysis is attached hereto. The analysis resulted in an estimate of soil erosion due to rainfall runoff of less than 1 ton per acre per year.



Potential frost action problems, caused by ice formation in the system, will be controlled by eliminating at least one of the conditions necessary for ice lens formation. Frost heave problems are caused by ice lens formation in certain soils. Three conditions are necessary for this ice lens formation: a frost susceptible soil, freezing temperatures and a supply of water (Mitchell, 1976). The sand blanket drain and PVC membrane will eliminate any underlying moisture supply which is required for ice lensing. Although the CL materials used in the clayey soil layer component may be somewhat frost susceptible, absence of an underlying source of moisture will minimize frost heave problems.

Due to the layered cover system, consideration must also be given to internal drainage and erosion of the granular drainage blanket into the perforated pipe drain. The analysis attached hereto presents an evaluation of the hydraulic characteristics of the drainage blanket. Briefly, the evaluation indicates that the sand blanket should be capable of collecting percolating water which passes through the silty clay layer, and transmitting this water to the pipe drain. The pipe drain has capacity in excess of that required to transmit the expected percolation flows. This drain will discharge off the cover through three discharge pipes. A single 4-inch diameter discharge should have sufficient capacity for this purpose, but additional discharge pipes are included to provide assurance that rapid discharge is achieved.

Lastly, it is proposed that the pipe drain will be wrapped with a geotextile filter material to prevent intrusion of the sand blanket particles into the pipe drain. This filter material will possess an equivalent opening size (EOS) no greater than the opening size of a #70 standard sieve, thereby effectively filtering the sand in the drainage blanket.

Cover Integrity During Settlement

Due to the extensive period of cell filling on this project, a large portion of the fill settlement will occur long before cell closure. Nevertheless, the analysis attached hereto provides an estimate that the maximum post-closure settlement of this cell cover should be approximately 5 feet. It should be noted that general, miscellaneous refuse consolidates more than typical industrial waste. Since the area surrounding Cells I and II will be filled with miscellaneous solid waste, these areas can be expected to settle a similar amount or more than the final cover on Cell II. The dikes constructed around Cells I and II may settle somewhat less, thereby helping to eliminate any possibility of run-on from the surrounding areas. Nevertheless, the cover will be inspected during the condition surveys discussed above to detect areas where the uniform surface grade is disrupted, possibly impeding surface drainage. Such a condition will be corrected by placing additional compacted clay fill (after stripping the topsoil) on the cover to restore the original grade insofar as necessary to re-establish proper drainage. Subsequent replacement of the topsoil and revegetation in the affected area will be undertaken. Note that additional drainage pipes, in excess of the minimum required, are being placed within the drainage blanket to assist in drainage in the event that settlement occurs.

The proposed cover system will have much more capability to maintain integrity during fill settlement than covers consisting of only compacted soil. This is because PVC membrane materials can withstand extensive elongation or strain (up to 300 percent) in comparison with soil materials. Nevertheless, it is intended that local differential settlements will be minimized by compaction during waste



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placement and prevention of major voids within the fill. It is anticipated that recommendations by the PVC membrane manufacturer will be followed regarding the provisions for sufficient excess material (slack) placement of the PVC membrane.

Cover Permeability

The use of a membrane for one component of the cover system, if constructed properly, effectively reduces the potential leakage through the cover to a negligible level. As stated previously, 40 CFR 264.310 (a) requires that the cover possess a permeability less than or equal to the permeability of the leachate containment system at the base of the landfill. Since a synthetic membrane is proposed for use in the cover, the permeability of the cover can be considered to meet the requirements of this provision, as suggested in 40 CFR 264 Preamble (47 FR 32314).

REFERENCES

Lutton, R.J., Evaluating Cover Systems for Solid and Hazardous Waste, U.S. EPA SW-867, 1980, 57 pp.

Mitchell, J.K., Fundamentals of Soil Behavior, 1976, 422 pp.



DESIGN SPECIFICATIONS - CELL II FINAL COVER
ALLEN PARK CLAY MINE LANDFILL

I. CONSTRUCTION OF BEDDING LAYER.

- A. The layer upon which the flexible membrane liner (FML) is to be placed shall consist of a minimum of 12 inches of silt, clayey silt, or silty clay with a soil classification of ML, CL-ML, or CL (ASTM D-2487), as shown on the design plans.
- B. The upper 4 inches of the layer shall not contain particles larger than 1 inch in diameter.
- C. The surface of the layer shall be rolled with a smooth drum steel or pneumatic roller so as to be free of irregularities, loose earth, and abrupt changes in grade.
- D. No FML shall be placed in ponded precipitation or in any area which has become softened by precipitation.
- E. The FML installer shall provide written certification as to the acceptability of the surface preparation of the layer prior to each day's installation of FML.
- F. The bedding layer shall not be placed upon frozen material nor shall frozen material be placed in the bedding layer.

II. FLEXIBLE MEMBRANE LINER.

- A. A 10-mil PVC flexible membrane liner shall be installed on the bedding layer described above as shown in the design plans.
- B. An experienced, reputable installer shall be retained to install the FML. This organization shall provide detailed information verifying its FML installation experience.
- C. The FML shall be installed according to the manufacturer's specifications. Detailed records concerning the materials used, storage and handling methods, seaming, installation, and quality control inspections/tests shall be maintained by the manufacturer and installer. Such records shall be submitted to the permit applicant upon request.
- D. The permit applicant shall provide full-time, on-site inspection by qualified personnel during FML installation to assure compliance with the manufacturer's specifications.

III. CONSTRUCTION OF THE FML PROTECTION/DRAINAGE BLANKET LAYER.

- A. The granular material comprising this layer shall be classified as Class II Granular Material according to MDOT (1984), based on grain size testing of at least one sample per every 5000 cubic yards, measured in place. This layer shall be at least 12 inches in thickness as shown on the design plans.



- ... (PPI) ... design plans ... width and will ... of pipe length. provide ... a non-woven, needle-punched geotextile ... an equivalent opening size no greater than ... standard sieve and a permeability no less than ...
- E. The full design thickness of the granular material shall be placed on the FML or the drainage pipe.
- F. Granular layer thickness measurements shall be obtained at a rate of at least once per every half-acre to verify conformance with design requirements. These measurements shall consist of direct measurements or before/after surface elevation surveys.
- G. The granular layer shall not be placed upon frozen material nor shall frozen material be placed in the bedding layer.
- IV. CONSTRUCTION OF THE COMPACTED CLAY LAYER.
- A. A compacted, fine-grained, cohesive soil layer shall be placed over the FML protection and drainage blanket layer. This layer shall be at least 3 feet in thickness as shown on the design plans.
- B. The soil shall meet the CH or CL soil classification as determined by ASTM D-2487 on samples obtained from the borrow material at least once per every 25,000 cubic yards of final, in-place volume.
- C. Each of the samples described in IV B above shall be subjected to ASTM D-1557 in order to obtain the optimum moisture content and maximum dry density.
- D. Testing of the borrow material shall be performed to evaluate the saturated hydraulic conductivity of the soil when compacted to the specifications of IV B below. This testing shall be performed using falling head methods according to one of the procedures presented in U.S. Department of the Army EM1110-2-1906. This testing shall be performed once on soil from each borrow source or when material classification changes.
- E. The soil shall be placed in lifts with maximum loose thickness of nine inches.
- F. No frozen soil shall be used in any lift, nor may any soil be placed on a frozen base.
- G. The soil shall not be placed in a manner that would trap ponded water.

- H. The soil shall be compacted with sheepsfoot-type compactors to achieve density values equal to or greater than 90 percent of the maximum dry density. The moisture content during compaction shall be between 2 percent below and 5 percent above optimum moisture content.
- I. Values for density in field compacted soils shall be determined by ASTM D-2922 at least once per every 1000 cubic yards of compacted soil to verify compliance with the specifications above.
- J. Values for moisture content in field compacted soils shall be determined by ASTM D-3017 at least once per every 1000 cubic yards of compacted soil to verify compliance with the specifications above.
- K. The thickness of the compacted clay layer shall be determined by direct measurements or by before/after surface elevation surveys. The thickness determinations shall be made at least every one-half acre.

V. TOPSOIL.

- A. A layer of topsoil at least 4 inches thick after grading shall be placed over the clay layer described above as shown in the design plans.
- B. The topsoil shall consist of natural, organic surface soil, exclusive of any peat or marl-like soils.
- C. The surface of the topsoil layer shall be loosely packed to provide an acceptable seed bed.
- D. Direct measurements of topsoil thickness shall be obtained at the rate of at least once per every half-acre to verify compliance with the design plans.

VI. VEGETATIVE COVER SPECIFICATIONS.

- A. The topsoil described in VII E must be fertilized with 12-12-12 N-P-K at the rate of 650 pounds per acre.
- B. The following seed mix must be sown into the topsoil after the third week in August and before the fourth week in September:

<u>Seed</u>	<u>Percent by Weight</u>
a. common cereal rye	20 to 30
b. common creeping red fescue	20 to 30
c. common Kentucky bluegrass	5 to 10
d. Kentucky 31 tall fescue	100 - (a+b+c)

- C. The seed mix must have a germination rate of at least 80 percent.
- D. The seed mix must be applied at the rate of 200-225 pounds per acre.
- E. The seed bed must be rolled during or immediately after seed application.



the cover crop must
or equivalent actual

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JOB Allen Park Clay Mine PROJECT NO. 84185 SHEET NO. 1/9
SUBJECT Final Cover BY RIF DATE 5/22/84
CHK. BY WRB DATE 6/15/84

FINAL COVER EVALUATION

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SOIL EROSION

The Universal Soil Loss Equation as
presented in U.S.E.P.A. SW-867, 1982;

$$A = R K L S C P$$

where:

A = average annual soil loss in tons/acre

R = rainfall/runoff erodibility factor

use R = 110 (from fig. 20 USEPA
SW-867, 1982)

K = soil erodibility factor in tons/acre

use K = 0.25 silty clay cover
w/little or no organic content

LS = slope length and steepness factor

maximum length north-south \approx 1200 ft

maximum overall grade = 4% so

LS = 1.1 (Table 6, USEPA SW-867, 1982)

C = cover management factor

continuous grassy cover
(meadow maximum)

use C = 0.025 (Table 7, USEPA
SW-867, 1982)

P = conservation practices to reduce erosion

use P = 1.0 conservative assumption; no
support practices

-337- (Table 8, USEPA SW-867, 1982)

PROJECT NO. _____

BY _____

CHK. BY _____

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$$A = 110(0.25 \text{ tons/acre})(1.1)(0.025)(0.76 \text{ tons/acre})$$

Erosion loss is less than 1.0 ton per acre

FUNCTION OF DRAINAGE BLANKET

- to transmit water percolating through the compacted clayey soil layer off the cell.

I. Total Percolation through silty clay layer

Assume backup saturation within of the clay with no ponding blanket

Use: $q = K_c I$

where: K_c = compacted permeability of silty clay cover layer

I = hydraulic gradient

Use: $K_c = 5.8 \times 10^{-8} \text{ cm/sec}$ - permeability of 2 remolded gray silty clay samples from site compacted 90% or more.

$I = 1.0$ because clay is assumed saturated without ponding on top of cap.

see: Hydrogeological Report - Allen Park Clay Mine MTE, 11/24/81



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JOB Allen Park Clay Mine PROJECT NO. 84185 SHEET NO. 3/9
SUBJECT Final Cover BY RFG DATE 5/23/84
CHK. BY WRB DATE 6/15/84

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$$q = K_c I = 5.8 \times 10^{-8} \frac{\text{cm}}{\text{sec}} (1.0) \left(\frac{1 \text{ in}}{2.54 \text{ cm}} \right) \left(\frac{3600 \text{ sec}}{\text{hr}} \right) \\ = 8.2 \times 10^{-5} \text{ in/hr}$$

maximum percolation for 1200' strip (1 ft wide) through the clay \Rightarrow

$$8.2 \times 10^{-5} \text{ in/hr} \left(\frac{14.965 \text{ gpd/ft}^2}{\text{in/hr}} \right) = 1.23 \times 10^{-3} \text{ gpd/ft}^2$$

$$\text{so } 1.23 \times 10^{-3} \text{ gpd/ft}^2 (1200 \text{ ft}) = 1.47 \text{ gpd/ft of width}$$

II. Flow through sand Blanket Drain

sand in blanket drain is Class II

according to: MDOT (1984)

Class II Fine Aggregate is primarily a fine sand with a maximum of 7% silt or clay-sized material

$$\text{use } K \approx 1.0 \times 10^{-2} \text{ cm/sec (Matrecon, 1980)}$$

Assume minimum slope is 3%
with slope length = 1200 ft

If layer is flowing full with no excess head at base of clay:

$$Q = K I A$$

use unit area, i.e. 1 ft thick, 1 ft wide

$$\text{so: } Q = 1 \times 10^{-2} \frac{\text{cm}}{\text{sec}} \left(\frac{2.12 \times 10^4 \text{ gpd/ft}^2}{1 \text{ cm/sec}} \right) (0.03 \text{ ft/ft}) (1 \text{ ft})$$

$$Q = 6.4 \text{ gpd/ft of width}$$



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JOB Allen Park Clay Mine PROJECT NO. 84185 SHEET NO. 4/9
SUBJECT Final Cover BY R+G DATE 5/20/84
CHK. BY WRP DATE 6/15/84

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SO DRAINAGE BLANKET CAPACITY (6.4 gpd/ft)
exceeds estimated inflow (1.5 gpd/ft) along a
1ft wide strip by ≈ 4 times.

III Edge Drain Capacity

Edge drain is 4" ϕ @ 0.1% slope (min)
for maximum flow capacity - use Hazen Williams eqn.

$$V = 1.318 C_{hw} R_h^{0.63} S^{0.54}$$

$$Q = VA \quad \text{continuity eqn.}$$

where:

Q = flow, ft³/sec

V = velocity, ft/sec

C_{hw} = roughness coefficient

use $C_{hw} = 80$ (conservative)

R_h = hydraulic radius = pipe dia./4 (if flowing full)

$$R_h = 4"/4 = 0.083 \text{ ft}$$

S = slope of pipe

assume $\geq 0.001 = 0.1\%$ slope

A = area, ft²

$$= (0.333 \text{ ft})^2 \cdot \frac{\pi}{4} = 0.087 \text{ ft}^2$$



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JOB Allen Park Clay Mine
SUBJECT Final Cover

PROJECT NO. 84185

SHEET NO. 59

BY RTG

DATE 5/30/84

CHK. BY WRB

DATE 6/15/84

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$$\begin{aligned} V &= 1.318 (80) (0.083)^{0.63} (0.001)^{0.54} \\ &= 1.318 (80) (0.21) (0.024) \\ &= 0.53 \text{ ft/sec} \end{aligned}$$

$$\begin{aligned} Q &= (0.53 \text{ ft/sec}) (0.087 \text{ ft}^2) \\ &= 0.046 \text{ ft}^3/\text{sec} = 29700 \text{ gal/day} \end{aligned}$$

$$\begin{aligned} \text{Maximum infiltration through clay cover} &= 1.23 \times 10^{-3} \text{ gpd/ft}^2 \\ \text{proposed hazardous waste cover area} \\ &= 670 \text{ ft} \times 1200 \text{ ft} = 804,000 \text{ ft}^2 \end{aligned}$$

$$Q_{\text{infiltrate}} = 1.23 \times 10^{-3} \text{ gpd/ft}^2 \times 804,000 \text{ ft}^2 = \underline{989 \text{ gpd}}$$

Therefore drain capacity exceeds expected flow by over one order of magnitude. A single drain will be sufficient. However, additional drain pipes and 3 outlets are included for redundancy.

IV Filter Requirements between pipe and Class II sand.
Use geotextile filter. see design of leachate collection system.



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JOB Allen Park Clay Mine PROJECT NO. 84185 SHEET NO. 6/9
SUBJECT Final Cover BY R+C DATE 6/1/84
CHK. BY WRB DATE 6/15/84
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V Open Area on Perforated Pipe

Assume maximum inflow to perimeter drain

is 1.47 gpd/ft (with S.F. = 2 — use 3.0 gpd/ft)

Limit Entrance Velocity to 0.1 ft/sec (U.S. Army TM
5-818-5, 1971)

$$\frac{3.0 \text{ gpd/ft}}{0.1 \text{ ft/sec}} = 4.6 \times 10^{-5} \text{ ft}^2/\text{ft}$$

$$\text{OR } 0.007 \text{ in}^2/\text{ft}$$

Required open area on perforated pipe is 0.007 in²/ft
to handle maximum infiltration. Actual open area
will be at least 0.25 in²/ft. Will use 1/4" ϕ holes.



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JOB Allen Park Clay Mine PROJECT NO. 84185 SHEET NO. 7/9
SUBJECT Final Cover Evaluation BY WRB DATE 6/21/84
CHK. BY LJS DATE 6/27/84

Settlement

Primary consolidation of the waste will occur very rapidly. Sowers (1973) indicates this will be within 1 month of loading. Construction of the final cover can be expected to be completed within 9 months of receipt of last wastes (40 CFR 264.113). The cell will be filled slowly over an extensive period. For analysis, we will assume that all primary consolidation and the first 5 years of secondary compression will be complete prior to cover construction.

Assume the moderately compacted industrial wastes will possess a void ratio of approximately 2.0

$$\alpha_{\text{secondary}} \approx .09 e_0 = .09(2) = 0.18 \rightarrow \underline{\underline{\text{use } 0.2}}$$

(Sowers, 1973)

This is for conditions unfavorable to decomposition because no general refuse is in this cell.



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JOB Allen Park Clay Mine PROJECT NO. 84185 SHEET NO. 2/9
 SUBJECT Final Cover Evaluation BY WRB DATE 6/21/84
 CHK. BY LJS DATE 6/27/84

$$\frac{\Delta H}{H} = \frac{\alpha \log(t_2/t_1)}{1 + e}$$

$$t_1 \approx 5 \text{ yrs}$$

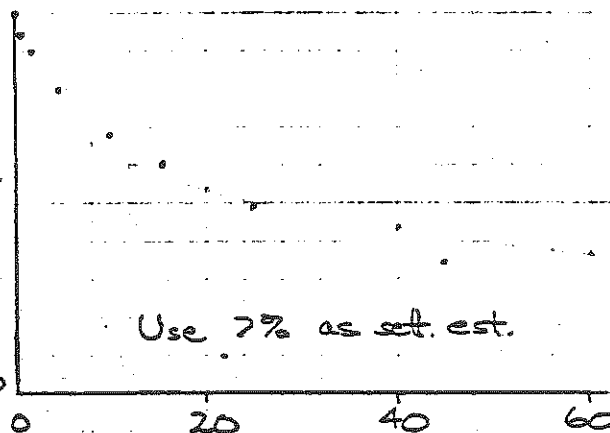
t_2 $\Delta H/H$

6	.005
7	.010
10	.020
15	.032
20	.040
30	.052
50	.067

$\Delta H/H$

.05

.10



Use 7% as sett. est.

Time after cover placement (years)

Estimate of post-cover

settlement $\rightarrow \underline{\underline{\Delta H/H \approx 7\%}}$

Post-cover settlement estimates:

Max. fill depth occurs near 6800 E

Surface grade = 634 Base grade = 564

$(634 - 564) - 5 \text{ ft (cover)} = 65 \text{ feet of fill}$

$65 \times .07 = 4.55 \text{ ft} \rightarrow \text{Max est. sett.} = 5 \text{ ft.}$



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JOB Allen Park Clay Mine PROJECT NO. 84185 SHEET NO. 9/9
SUBJECT Final Cover Evaluation BY LJS DATE 6-27-84
CHK. BY WRP DATE 6/28/84

References

Lutton, R.J., Evaluating Cover Systems for Solid and Hazardous Waste, U.S. EPA SW-867, 1980, 57 pp.

Matrecon, Inc., Lining of Waste Impoundment and Disposal Facilities, SW-870, U.S. EPA, 1980, 385 pp.

Michigan Testing Engineers, Inc., "Hydrogeological Study; Allen Park Clay Mine, Allen Park, Michigan", 1981, 41 pp. plus Appendices.

U.S. Department of the Army, Dewatering and Groundwater Control for Deep Excavations, TM 5-818-5, 1971, 187 pp.

I-2 Post-Closure Plan 40 CFR 270.14(b)(13)

Ford Allen Park Clay Mine

Landfill Post-Closure Plan

July 10, 1984

Site Name: Ford Motor Company Allen Park Clay Mine
Site I.D. #: MID 980568711
Owner's Name: Ford Motor Company
Site Address: 17250 Oakwood Blvd., Allen Park, Michigan 48101
Telephone: (313) 336-5725
Contact: J. S. Amber
 628 W. Parklane Towers
 Dearborn, Michigan
 (313) 322-4646

I-2a Facility Inspection Plan 40 CFR 270.17(g)

Inspection logs are to be kept that indicate, frequency and inspection procedures, which are explained below.

1. Security Control: Fencing, gates, locks, and warning signs are to be inspected for vandalism and disrepair on a weekly basis.
2. Leachate Collection System: The pump, switch mechanism, discharge line, and power supply are to be inspected on a weekly basis until leachate is no longer detected. At such time inspections are to be made monthly until leachate is no longer generated. The inspection shall include:

2. Leachate Collection System: (Cont'd)

- a) record leachate levels in the sumps.
- b) vandalism to any part of system.
- c) power supplied appropriately.
- d) notation of observations concerning system.

3. Damage to Cover and Drainage: Inspections will be directed toward the identification of:

- . invasion of undesirable plant species (deep rooted plants such as woody plants).
- . deterioration of vegetative cover.
- . disruption of drainage grades due to settlement.
- . soft, wet, or unstable areas of the cover.
- . areas of surface erosion.
- . obstructions, erosion, or deterioration of surface drainage features.
- . obstructions, or damage to the discharge pipes in the cover drainage layer.
- . burrowing by animals.
- . surface disturbance due to excavation or unwarranted vehicle traffic.

Such inspections should be performed quarterly, because erosion damage and problems with cover require several months to develop.

4. Well Condition: Inspection of the monitor wells should include noted evidence of vandalism or disrepair such as broken caps, corrosion of casing, displacement of annular seal, etc. on a quarterly basis consistent with present active operating procedure.

I-2b Monitoring Plan

- . Groundwater monitoring - The facility is exempt from groundwater monitoring under 40 CFR 264.90(b)(4).
- . Leachate Monitoring - Leachate will be pumped from the manhole sumps to an equalization tank which meets the definition of "wastewater treatment unit" as specified in 40 CFR 260.10. Discharge will be to the Detroit Water and Sewerage Department public sewer.
- . Leak Detection Between Liners - The facility does not have a leak detection system.

I-2c Maintenance Plan 40 CFR 270.17(g)

The facility inspections will identify the maintenance problem which will then activate the appropriate corrective maintenance procedure as follows:

1. Security Control: Repair fence and gates if required, and replace locks and warning signs if necessary.
2. Leachate Collection System: Replace or repair the following equipment if required.
 - . pump
 - . switch mechanism
 - . discharge line
 - . power supply

3. Cover System and Drainage: The proposed remedial efforts will be undertaken to bring the cover and drainage systems back to original design insofar as possible.
- . Undesirable plants - cut or poison.
 - . Deterioration of vegetative cover - fertilize, reseed, and mulch.
 - . Disruption of drainage grades due to settlement - strip the topsoil, place additional compacted clay fill on the cover to restore the original grade insofar as possible to re-establish proper drainage, and replace the topsoil and vegetation in the affected area.
 - . Soft, wet or unstable areas of the cover - remove the soft, wet, or unstable material, and restore the area to original design insofar as possible.
 - . Areas of surface erosion - restore the affected area to original design using additional soil and seed.
 - . Obstruction, erosion, or deterioration of surface drainage features including perimeter drain - clean out the ditches with a backhoe, and regrade or restore eroded features.
 - . Obstruction or damage to the discharge pipes in the cover drainage pipes in the cover drainage layer - clean out pipes utilizing a snake or reamer if drainage is obstructed. Replace or repair the pipe if it is damaged.
 - . Burrowing by animals - fill burrows, and apply chemical treatment to soil which discourages animal burrowing if necessary.

3. Cover System and Drainage: (Cont'd)

- . Surface disturbance - regrade or restore the cover to original design utilizing additional soil if necessary.

4. Well condition - repair or replace broken caps, casings, annual seal and lock if necessary.

I-3

Notice in Deed to Property 40 CFR 270.14(b)(14)

Provided as Attachment 24 is a copy of the facility hazardous waste notice in the property deed entitled "Restrictive Covenant".

This document was executed and submitted to the Michigan Department of Natural Resources on August 14, 1981, in response to licensing requirements under Act 64, P.A. of 1979, 299.539 Section 39 and R299.6503, Rule 503(1)(i).

Accordingly, as required under Section 39, the Restrictive Covenant was executed by the MDNR Director and filed with the Wayne County Register of Deeds.

RESTRICTIVE COVENANT

THIS RESTRICTIVE COVENANT made as of the 13th day of August, 1981, by and between, Ford Motor Company (Ford) whose address is The American Road, Dearborn, Michigan 48121, and Howard A. Tanner, (Director) Director of the Michigan Department of Natural Resources for and on behalf of the State of Michigan, whose address is DNR Executive Division, 7th Floor Mason Bldg., Lansing, Michigan, 48909.

WITNESSETH THAT:

WHEREAS, Ford has applied or will apply for licensure under provisions of 1979 PA 64, MCLA 299.501 et seq, for the purpose of conducting, managing, maintaining or operating a disposal area upon land situated in the City of Allen Park, County of Wayne, more particularly described on the Exhibit A attached hereto; and

WHEREAS, 1979 PA 64, supra, Section 39 requires that before operation of a landfill, an instrument which imposes a restrictive covenant upon the land involved shall be executed by all the owners of the tract of land upon which the landfill is located and the Director.

NOW THEREFORE, Ford does for itself, its heirs, successors, lessees, or assigns declare, covenant and agree that the land hereinbefore described has been or will hereafter be used as a landfill for disposal of hazardous waste, and that neither Ford nor its servants, agents, employees, nor any of its heirs, successors, lessees or assignees shall engage in filling, grading, excavating, building, drilling or mining on the property following completion of the landfill without authorization of the Director.

Signed in presence of:

Howard A. Tanner
 * Michael J. Kelly
 * Director of Natural Resources

Signed in presence of:

 * _____
 *

Signed

FORD MOTOR COMPANY - OWNER

By Michael J. Kelly
 Its Assistant Secretary

STATE OF MICHIGAN

By Howard A. Tanner

Its Director of the Department
 of Natural Resources for
 the State of Michigan

STATE OF MICHIGAN)
) ss
COUNTY OF WAYNE)

The foregoing instrument was acknowledged before me this 13th day of August, 1981 by Sidney Kelly, an Assistant Secretary of Ford Motor Company, a Delaware corporation, on behalf of the corporation.

Sandra G. Jelonneau
*Notary Public
Sandra G. Jelonneau
WAYNE County, Michigan
My Commission Expires 9-8-83

STATE OF MICHIGAN)
) ss
COUNTY OF INGHAM)

The foregoing instrument was acknowledged before me on this ____ day of _____, 1981, by Howard A. Tanner, Director of the Department of Natural Resources, on behalf of the State of Michigan.

*Notary Public

Ingham County, Michigan
My Commission Expires _____

When recorded, return to:

State of Michigan
Department of Natural Resources
Solid Waste Management Division
Lansing, Michigan 48910

*Type or print name under signature

Drafted By:

Michael J. O'Reilly
The American Road
Dearborn, Michigan 48121

LEGAL DESCRIPTION OF HAZARDOUS WASTE CELLS
AT FORD MOTOR COMPANY
ALLEN PARK CLAY MINE

A parcel of land in Private Clain 66 also being part of Lots 1, 2, 3 and 4 of Walker and Wilcox Plat of P.C. 66, City of Allen Park, Wayne County, Michigan, more particularly described as:

Beginning at a point distant S 58° 37' 20" E, 1697.41 feet, and S 48° 23' 02" W, 491.60 feet, and S 23° 45' 37" W, 583.36 feet, and S 70° 48' 45" E, 527.01 feet from the SE corner of Southfield Expressway (350 feet wide) and Oakwood Boulevard (100 feet wide) and continuing thence S 61° 21' 45" 218.07 feet; thence S 85° 38' 46" E, 143.76 feet; thence S 62° 00' 53" E, 47.79 feet; thence S 36° 52' 13" E, 101.55 feet; thence S 38° 04' 32" E, 103.44 feet; thence S 19° 17' 50" W, 281.45 feet; thence S 31° 34' 40" W, 294.98 feet; thence N 58° 26' 05" W, 644.32 feet; thence S 31° 32' 52" W, 106.55 feet; thence N 58° 26' 05" W, 525.00 feet; thence N 31° 32' 52" E, 643.15 feet; thence S 61° 21' 45" E, 525.68 feet to the point of beginning. Containing 16.500 acres of land, more or less.

Closure Cost Estimate 40 CFR 270.14(b)(15)

Closure cost estimate is calculated to cover the cost of closure when the cost would be greatest and the exposed area is at a maximum (10 acres) (40 CFR 264.142(a)). This cost is updated annually using an inflation factor.

(July 10, 1984)

1. Application of bedding layer for PVC cover

10 acres @ 1 ft. of subbase or

16,133 Yd.³ @ \$1.50 yd.³ \$ 24,200

inspection cost \$ 3,000

2. 10 mil PVC cover material and installation

435,600 ft.² @ \$.15/ft.² \$ 65,340

inspection cost \$ 3,000

3. Drainage pipe

materials: 1,800 ft. @ \$.85/ft. \$ 1,530

labor: 1,800 ft. @ \$1.15/ft. \$ 2,070

inspection cost: \$ 500

4. Drainage blanket

10 acres @ 1 ft. or

16,133 yd.³ @ \$1.50 yd.³ \$ 24,200

inspection cost \$ 3,000

5. Compacted Clay

10 acres @ 3 ft.

48,399 yd.³ @ \$1.50 yd.³ \$ 72,600

inspection cost \$ 9,000

Closure Cost Estimate 40 CFR 270.14(b)(15) (Cont'd)6. Topsoil

10 acres @ 4 inches or

5,378 yd.³ @ \$1.50 yd.³

inspection cost

\$ 8,000

\$ 1,000

7. Fertilize, seed, mulch

10 acres @ \$1,000 acre

\$ 10,000

Total\$227,507

I-5e, 7e, Financial Test for Closure and Post-Closure 40 CFR 264.134(f)

8a(2), Provided as Attachment 25 is a copy of the financial assurance

8b(2) mechanism for closure, post-closure, and liability coverage.



Ford Motor Company

The American Road
P.O. Box 1899
Dearborn, Michigan 48121

March 30, 1984

Regional Administrator
U.S. EPA, Region V
230 South Dearborn Street
Chicago, IL 60604

Subject: Hazardous Waste Management Financial Requirements

I am the chief financial officer of

Ford Motor Company
The American Road
Dearborn, Michigan 48121

This letter is in support of the use of the financial test to demonstrate financial assurance for liability coverage and closure and/or post-closure care, as specified in Subpart H of 40 CFR Parts 264 and 265.

1. The owner or operator identified above owns or operates, the following facilities for which financial assurance for closure or post-closure care is demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by the test are shown for each facility:

See Attachment 1

2. The owner or operator identified above guarantees, through the corporate guarantee specified in Subpart H of 40 CFR Parts 264 and 265, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility:

See Attachment 2

3. In States where EPA is not administering the financial requirements of Subpart H of 40 CFR Parts 264 or 265, this owner or operator is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by such a test are shown for each facility:

See Attachment 3

4. The owner or operator identified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in Subpart H of 40 CFR Parts 264 and 265 or equivalent or substantially equivalent State mechanisms. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility:

None

This owner or operator is required to file a Form 10K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this owner or operator ends on December 31. The figures for the following items marked with an asterisk are derived from this owner's or operator's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 1983.

Part B: Closure or Post-Closure Care and Liability Coverage

(Alternative II)

- | | |
|---|---|
| 1. Sum of current closure and post-closure cost estimates | \$10,070,355 |
| 2. Amount of annual aggregate liability coverage to be demonstrated | \$ 8,000,000 |
| 3. Sum of lines 1 and 2 | <u>\$18,070,355</u> |
| 4. Current bond rating of most recent issuance and name of rating service | Not rated-private placement (Ford's Senior long term debt is rated BBB+ by Standard & Poor's and A3 by Moody's) |
| 5. Date of issuance of bond | Dec. 15, 1983 |
| 6. Date of maturity of bond | Dec. 15, 2003 |
| *7. Tangible net worth | \$ 7,259 Million |
| *8. Total assets in the U.S. | \$ 13,229 Million |
| | <u>YES</u> <u>NO</u> |
| 9. Is line 7 at least \$10 million? | X |
| 10. Is line 7 at least 6 times line 3? | X |
| *11. Are at least 90% of firm's assets located in the U.S.? If not, complete line 12. | X |
| 12. Is line 8 at least 6 times line 3? | X |

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 264.151(g) as such regulations were constituted on the date shown immediately below.



W. M. Caldwell
Executive Vice President and
Chief Financial Officer
March 30, 1984

ATTACHMENT 3

<u>Facility and Address</u>	<u>EPA Region</u>	<u>EPA State/ID No.</u>	<u>Closure Costs</u>	<u>Post Closure Costs</u>	<u>Total</u>
Louisville Assembly Plt Fern Valley Road Louisville, KY 40201	IV	KY D071315899	\$ 289,139	-	\$ 289,139
Aeronutronic Division (Ford Aerospace) Ford Road Newport Beach, CA 92663	IX	CA D041330077	21,000	-	21,000
Western Development Labs (Ford Aerospace) 3939 Fabian Way Palo Alto, CA 94303	IX	CA D000030528	34,920	-	34,920
Parker Chemical Co. 5640 Knott Avenue Buena Park, CA 90620	IX	CA D060754231	16,355	-	16,355
Parker Chemical Co. 557 Route 23 Wayne (Mountain View), New Jersey 07470	II	NJ D056709421	11,366	-	11,366
Parker Chemical Co. 10800 Baur Boulevard St. Louis, MO 63132	VII	MO D057748063	12,501	-	12,501
		TOTAL	<u>\$ 385,281</u>	-	<u>\$ 385,281</u>

1/JLT12.EPV3/k

Costs provide for 16.5 acres of landfill.

(July 10, 1984)

1. Fertilization

Application of 800#/ac. of 12-12-12

over 16.5 acres @ 2 events

\$109/acre

\$ 3,597

2. Reseeding and Mulching

Assuming 10% replacement

over 16.5 acres

for first 3 years

\$1,000/ac. @ 4.95 acres

\$ 4,950

3. Erosion damage

Acreage involved: 16.5 acres

annual soil loss 1 yd³/ac.

transport soil, compact, seed @ \$45/yd.³

total cost: 30 years @ 16.5 ac. x \$45

\$ 22,275

4. Cover settlement

Repair settlements to design

specifications (estimated contingency)

\$ 20,000

5. Fencing

Replace 3,500 feet of chain link fence

@ \$6.30/ft.

\$ 22,050

6. Groundwater monitoring

Annual static water elevations

on artesian aquifer

8 hours @ \$30/hour x 30 years

\$ 7,200

7. Leachate collection system maintenance

Pump replacements (2)	\$ 5,000	
Power supply repairs	\$ 5,000	
Collection pipe clean outs	\$ 5,000	
Contingencies	\$10,000	\$ 25,000

8. Facility Inspections

(2 hours/week) (52 weeks/yr.) (30 years)
= 3,120 hours @ \$20 hour \$ 62,400

9. Administrative services

Annual cost -

Senior Engineer	8 hours @ \$50 hour	\$ 400	
Technical Services	20 hours @ \$20 hour	\$ 400	
Clerical Services	16 hours @ \$20 hour	\$ 320	
Annual Total Expense		\$ 1,120	
30 years @ \$1,120/year			\$ 33,600

Total \$201,072

Annual Cost \$6,702

Ford Allen Park Clay Mine

MID 980568711

Section J Other Federal Laws

Information will be provided in accordance with the requirements of 40 CFR 122.25(a)(20) at the request of the EPA Region V office. At this time, however, we believe the Ford Allen Park Clay Mine Landfill is in compliance with the following Federal laws; Wild and Scenic Rivers Act, National Historic Preservation Act of 1966, Endangered Species Act, Coastal Zone Management Act, and the Fish and Wildlife Coordination Act.

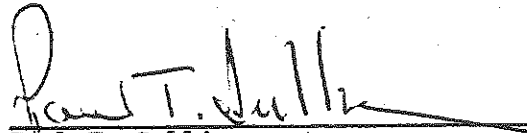
Ford Allen Park Clay Mine

MID 980568711

Section K Certification

Part B Certification 40 CFR 270.11

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.



Paul T. Sullivan

President

Rouge Steel Company

(per delegation of authority letter attached)



Executive Vice President
Ford Diversified Products Operations

June 21, 1983

Paul T. Sullivan
President
Rouge Steel Company
3001 Miller Road
Dearborn, Michigan 48121

Pursuant to authority redelegated to me by the President of Ford Motor Company (the "Company"), I hereby delegate to Paul T. Sullivan authority to take such action as he may deem necessary or appropriate with respect to assets of the Company included as a part of the assets of the former Steel Division of the Company but not transferred to Rouge Steel Company, up to the levels of authority of a Divisional General Manager of the Company as described in the Capital Assets section of the Executive Authorities Manual issued from time to time by the Company.

This authority supercedes my April 18, 1983 redelegation to Mr. P. T. Brosnahan.


T. C. Page

cc: Sidney Kelly

